The Electrical Review

VOL. CXIV. MAY 18, 1934. No. 2947.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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The Installation Trade

FAVOURABLE statements continue to reach us regarding activity in certain branches of the electrical trade. It follows as a matter of course when large additions are being made to electricity supply connections everywhere that installation contractors and those who sell the material and fittings used and fixed by them should be doing good business. They have the added satisfaction of knowing that still better times are in store, especially if competition is fair and reasonable and prices are right.

Some of our readers engaged in such work and trade have shown by their letters published in our "Correspondence" pages during the past month or two that they are anxiously concerned because they find ranged against them the competition of electricity supply undertakings—municipal and company alike. The subject, like the poor, is always with us, in spite of the improvement that has taken place as the result of organised efforts to secure co-operative policy between all the parties. The discussion continues in this issue in a reply which reminds contractors of their shortcomings.

We have always had sympathy for the smaller electrical contractor who is able to do good work but finds the forces arrayed against him too powerful. We do not favour restriction of enterprise, though the presence of too many small and possibly, therefore, unreliable and impecunious businesses spoils the trade for everybody, both in the matter of quality of work and as regards price. On the other hand, we do strongly support the pressing demand for high-class work, safety in the household, and good service to the consumer.

The contractor who cannot give these things, either alone or in co-operation, is, generally speaking, destined to a life of disappointment, for they are essential to an efficient electrical installation industry. But those who wax wroth at what they are pleased quasi-officially to call the "ignorance" of our correspondents should remember that there are many thousands of electrical contractors and dealers up and down the country who are not members of the established associations and know little, if anything, of either the E.C.A. or the Register.

Many of them are probably new to the business and have never heard of the contractors' organisation's campaigns against municipal trading, and they understand little about the efforts made—and very successfully, too—in many centres where harmonious relations exist between contractors and electricity supply authorities. It is useless to shut one's eyes to the fact that the average householder prefers to deal with the electricity authority for everything. It is up to the contractor to change that attitude by giving a service of full efficiency.

The electrical contracting and radio-dealing section—these two classes of trade are generally coupled together to-day—is the most constantly changing in the whole industry. Every week brings its list of newcomers and, unfortunately, sees a number of retirements. Few of the newcomers would be considered eligible for membership within the circle, but in many cases they may carry on quite useful work. If there be lack of education in some places regarding the existence, principles and record of the representative organisations, and proposals are advanced to form a new body to watch over the interests of the uninformed, who is to blame? Have matters reached a stage when size and importance and new desires engender a spirit of superiority towards "the little man"?

Plant Capacity

THE increase in the output of public generating stations during April of 24.5 per cent. over that of the corresponding month of last year is the largest yet recorded for a single month. This allows for one additional working day, which reduces the figure on a common basis to just over 20 per cent. It brings the advance for the first four months of the year over the same period of 1933 to 18.5 per cent. If this rate is continued until the end of December the maximum demand on stations will be about 850,000 kW greater this year, making the aggregate for the country about 5,500,000 kW, after taking account of

diversity. To meet this we have plant in a.c. stations with over 25,000 kW capacity, installed or under construction (excluding Fulham), of less than 6,200,000 kW. While the flexibility of the grid system and the serviceable character of many small stations will, no doubt, prevent a shortage of generating capacity in the near future, it would appear that the day of the large plant manufacturers may come again more quickly than many of us had anticipated.

The Consumer's Standpoint

THE electricity supply salesman will be more likely to secure good results if he pauses now and then to look at things from the standpoint of the consumer. In a useful article printed on a later page Mr. H. Smith, writing on "How to Sell Domestic Service," comes right down to earth and views some of the consumer's problems from the consumer's level. Electrical men who are acquainted with the difficulties as a result of their personal practical experience as users, and through the experience of consumer friends or clients, will help electrical development officers to improve their efficiency if they will record what they know instead of hiding it.

The Cutting-off Question

THERE seems to have been some difficulty in following recent legislative proposals regarding the conditions in which a consumer's supply can be disconnected. By the Act of 1882 an undertaking was empowered to disconnect an installation if accounts for electricity supplied were not paid; this was extended to deposits by the Clauses Act of 1899 and to other premises of the same consumer by the Act of 1909. Some undertakings were later given the right to recover expenses incurred in reconnecting cut-off installations—a right that was made generally applicable under the 1926 Act. A clause that was struck out of the recent Thorp Bill sought to authorise the cutting-off of consumers in default with payments for apparatus and fittings let on hire or hire-purchase also. As undertakings are no longer regarded as mere suppliers of energy, but as the providers of an inclusive service, it is only reasonable that they should be protected in the one case as in the other.

Ohm's Law

MR. H. M. SAYERS takes us to task in our "Correspondence" columns for saying in our leader of May 4th that there are certain conditions in which Ohm's law is inapplicable. Ohm's law states that in any circuit under constant physical conditions the ratio of the e.m.f. to the current is a constant. If we take the neon tube as an example, we shall find that the volt drop decreases as the current increases, so that the "constant" ceases to be a constant. Moreover, as the gas pressure is decreased the voltage drop decreases to a minimum, but rises rapidly with a further decrease in pressure in a way that is unrelated to any constant.

Progress in Electrical Science

THE conversazione of the Royal Society provides each year a rare opportunity for studying unusual aspects of electricity. At Burlington House one finds, for instance, examples of applications of piezo-electricity (charges exhibited by crystals under pressure) and such novelties as the use of the cathode-ray beam as an inertia-free compass. A method of measuring the speed of lightning, which it is said will hold good even if lightning travelled much faster than light, presumably leads us into the deep waters of relativity. From the most immediately utilitarian point of view, perhaps the most striking exhibit was the Met.-Vick. method of obtaining metallic coatings on insulating material by the condensation of metal evaporated in a high vacuum; this might have a field in the production of micro-ampere fuses among other things. The British Thomson-Houston Co. showed the remarkable colour correction obtainable in discharge lamps by the mixture of cadmium and of cadmium and zinc with the argon. Although such additions reduce the lumen efficiency appreciably, this may not be so important in the future if the initial efficiency can be maintained throughout the life of the lamp, which we anticipate will be the next line of advance in their development.

Water Circuit-breakers

THE circuit-breakers of the expansion type which have been installed by the Northmet Co. at its St. Albans substation are a sound job. It is not clear that they offer advantages over oil-filled gear in first cost, convenience in operation, or saving in space, although it was the last of these that was a principal reason given for the employment of breakers of the same type at the Barmen power-station, Germany, as described in our issue of February 29th, 1932. They resemble the old explosion-pot switches (but using steam as the quenching medium), and should, like these, be especially suitable where the use of large quantities of oil is undesirable. The pressure chamber has to withstand (for the 250,000-kVA 22-kV size) 1,400 lb. per sq. in., but the condensing chamber (which is a feature of the Ferguson Pailin breakers) only 42 lb. The manufacture in this country of new kinds of switchgear that have proved suitable on the Continent is to be commended, even if it does no more than provide confirmation of the view that for conditions normally prevailing here we are on the right lines in concentrating on the oil-filled breaker.

The Future of Television

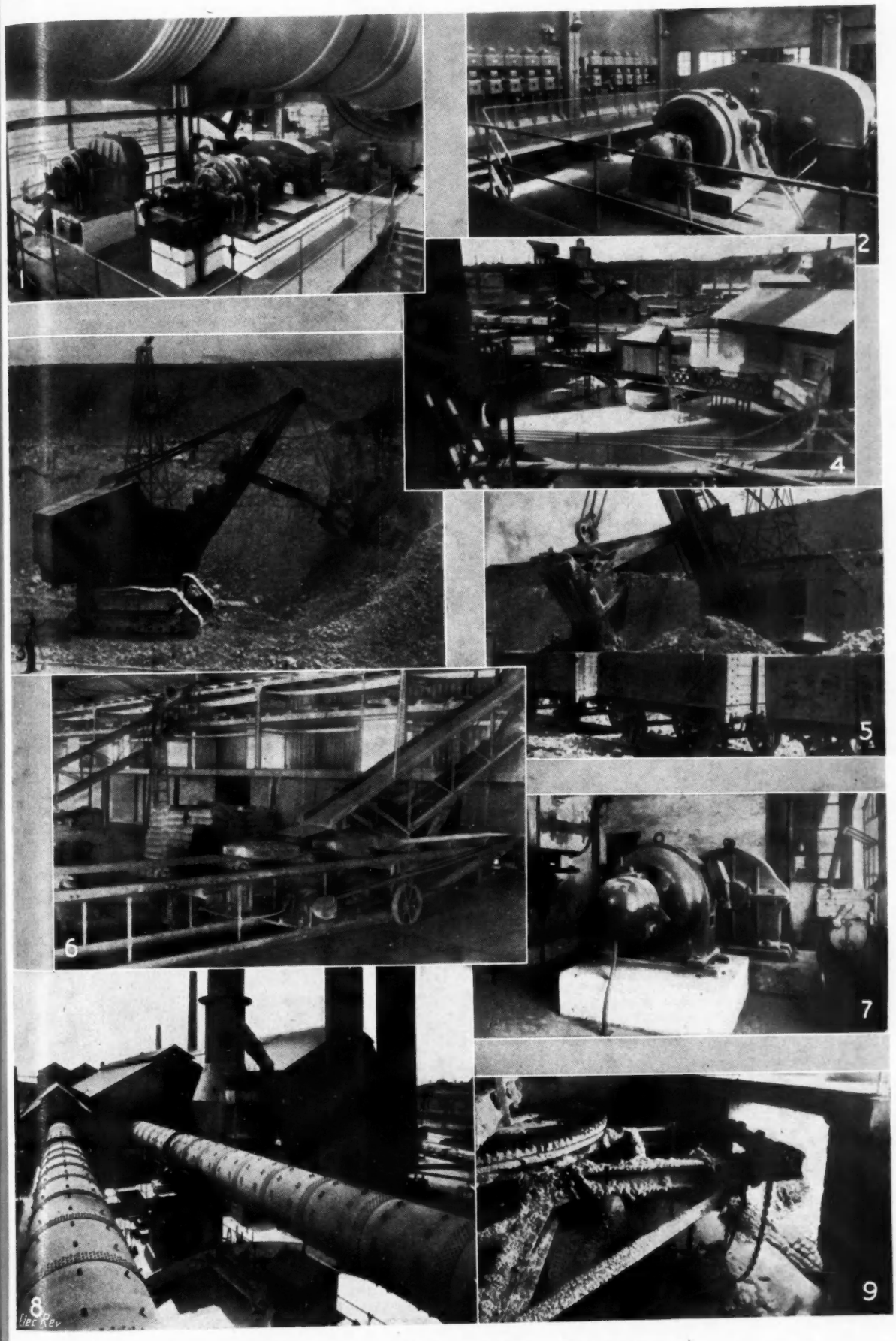
WE have a good deal of sympathy with the Government in its quandary as to the best way of providing a public television service. The initiation of a broadcasting service proved too much for the official machinery twelve years ago, and it was left to the enterprise of the radio manufacturers to meet the public demands. Yet broadcasting raised no difficult technical issues, as upon these there was general agreement. Television is likely to present far greater obstacles to unanimity. A number of technically diverse systems have been developed during recent years, each in its own direction, as a result of keen competition. No one of these seems obviously marked out as the sole survivor, and a reconciliation of the methods of reproduction and scanning will present considerable difficulties. The committee set up by the Postmaster-General with the unenviable task of deciding the relative merits of the systems bears a strongly official complexion. It includes no representatives of manufacturers or of the general public. The former will, no doubt, have an opportunity of expressing their views as expert witnesses; the public must be grateful for whatever outcome there may be.

The Choice of Insulators

ARISING out of the article in our last issue on "Modern Insulators," it would appear that the relative merits of the suspension and pin types for overhead lines are not recognised by all our readers. The tendency is for the use of the former to increase, especially on double-circuit lines, on account of easier maintenance due to greater clearances between the circuits. The suspension type has the following further advantages as compared with the pin type: greater span lengths are permissible; the failure of a single unit does not necessarily put a line out of commission; and there is less interference with radio reception. About the only thing to be said for the pin type at 22 kV and above is that it is cheaper.

Whither Broadcasting?

WE have seen an advertisement in which an inventor offers to "influential financiers" a system for the transmission and reception of smell by wireless. This appears to be not only a notable advance in the art of telecommunication, but also to suggest interesting possibilities. If smell can be broadcast, why not taste and touch? We look forward to the day when listeners to after-dinner speeches by radio will first be put into the proper mood for them by the actual reception of the meal.



The West Thurrock Cement Works. **(See next page)**

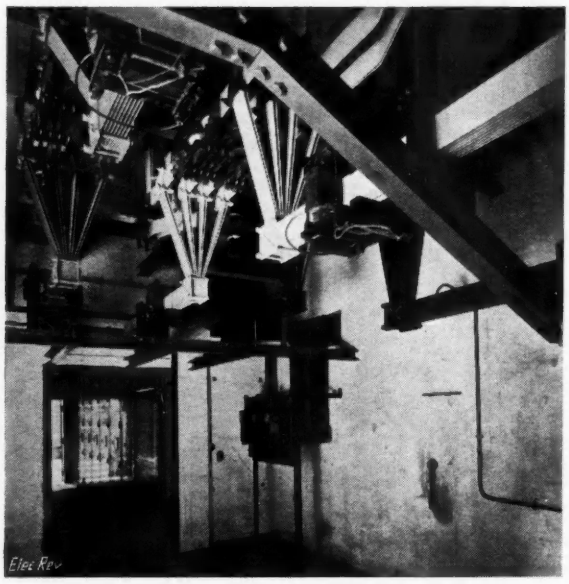
1. Two variable-speed a.c. motor kiln drives. 2. Main drive for cement mill. 3. An electric navvy at work at the quarry face. 4. Slurry storage basins showing the agitating gear. 5. Emptying a navvy bucket. 6. Portable band conveyor for lorry loading. 7. A pulverised-coal mill driving motor (225 h.p.). 8. Outdoor portions of kilns from above. 9. Part of the wash mill gear.

Cement Production

AN annual load factor of 87 per cent. resulting from the scientific regulation of the installation load, covering machinery which would normally produce heavy peaks, based on calculations from the estimated works output is probably the most noteworthy fact about the cement works at West Thurrock, Essex, of the Tunnel Portland Cement Co., Ltd. Prior to the commencement of a new year the probable cement output for the coming year is estimated, and from this a fairly close demand figure is obtained. The power house men are then instructed not to exceed this figure in any circumstances.

Three meters for the incoming power, each with a demand indicator, have their current coils in series. A fourth instrument in circuit with these operates a " slave " instrument in the engine room, which, in addition to recording consumption and indicating maximum demand, also makes a printed record of the demand for each period. All these four meters are operated by two synchronised time switches, so that there may be no disparity in the demand period.

To give adequate warning of a demand likely to exceed the predetermined figure, a contact on this slave instrument closes at two-thirds of the demand figure, while in series with it



Main 6,000-A bus-bars feeding h.p. cubicles.

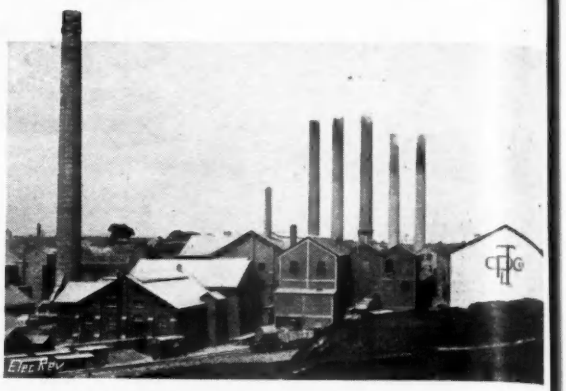
there is also a synchronous motor-operated time switch which has its contact closed for the first twenty minutes of every half-hour, and open for the last ten minutes. Should, therefore, more than two-thirds of the predetermined demand be exceeded for twenty minutes, the circuit will become closed and, hence, a warning signal given.

Chalk is excavated in the quarry on site by electrical navvies equipped with motors which operate on the Austin constant-current system. The three motors for racking, slewing, and hoisting are arranged in series, and d.c. is kept circulating all the time they are in circuit, control being effected by varying the field strength. They are supplied by a motor-generator set which has at either end " constant-current " and " constant-voltage " exciters. A very slight variation in the circulating current results in a very large variation in the generator terminal voltage, so that a stable condition is easily maintained.

The value of this system lies mainly in its flexibility. There are no fuses or circuit-breakers on the d.c. side, and the controllers are normally changed directly from full forward to full reverse with very easy working.

In the washmill department where the chalk is mixed with clay and water there are motors of up to 150 h.p. driving the mills and smaller motors for slurry pumps, hoists and trixes (mechanical sieves). The mills in this department employ ordinary ball grinding and are gear driven by motors of up to 250 h.p. usually through a long torsion shaft, so that the motor is protected by its distance from the mill from a good deal of the spilt slurry. Next the slurry is pumped into storage basins, each of which has a lattice girder pivoted at its central point and carrying four stirrers built of angle-iron frames. The stirrers are driven by a 20-h.p. motor situated at the centre of the girder, and their reaction against the slurry causes the main beam to rotate slowly on its centre pivot.

From the basins the slurry is fed to pulverised fuel-fired



The West Thurrock works of the Tunnel Portland Cement Co.

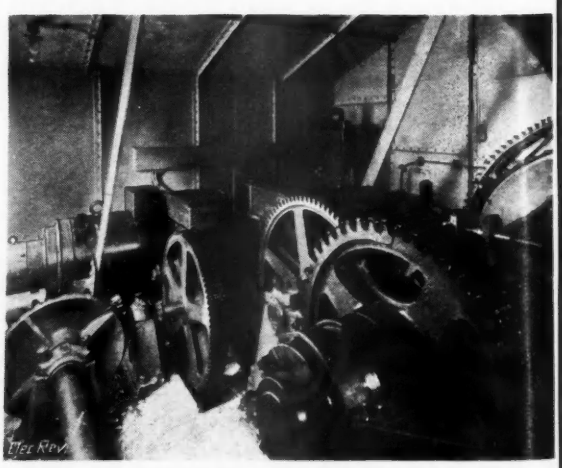
kilns in which it is dried, calcined and sintered. Each kiln is 100 yards long and is revolved slowly by a 125-h.p. a.c. commutator motor. In spite of the high temperature and generally bad conditions, the commutator is kept in good condition, probably on account of the highly graphitic brushes used. Synchronisation of the slurry feed with the kiln is achieved by a small alternator in tandem with the main motor, which supplies a lightly loaded induction motor driving the slurry feeding gear.

Shaker conveyors carry the clinker to the dry mill, an ordinary tube mill with divisions equipped separately and progressively with balls of 80 mm. diameter down to " cylpebs " or small cylindrical grinding bodies. The mill is driven by a 1,100-h.p. 3-kV motor through 720 to 18 r.p.m. twin double helical gearing which is so interlocked with the main motor that should any vital component, such as a bearing, move more than ¼ mm. from its proper place the whole equipment will shut down. Further, all auxiliaries are so interlocked one with the other that it is impossible for one machine to continue to supply material to the next unit if the latter is not running.

The produce of the mill is " blown " by compressed air to silos which feed electrically driven packing machines. Special paper sacks are slipped on to a spout and the cement is blown into them. When the desired capacity is reached the weight of the sack tilts the spout and thus cuts off its supply of cement. Finally conveyor bands deliver the sacks to waiting lorries.

The Supply Arrangements

Electricity is received from the County of London Electric Supply Co., Ltd., at 3 kV, by six three-core cables coupled in pairs as three feeders. These supply an ironclad distribution board on which are mounted duplicate compound-filled bus-bars and switchgear with a rupturing capacity of about 125,000 kVA. Part of the 3-kV supply is fed to another open set of bus-bars for distribution in the works where high voltage is



Austin constant-current equipment in an electrical navvy

used, and the supply for the remainder of the plant is stepped down through two 5,000-kVA Electric Construction Co. outdoor transformers in parallel.

From the low-pressure bus-bars eighteen remotely controlled cubicle-type 600- or 1,000-A oil circuit-breakers are fed. Cables from the cubicles terminate in heavy industrial type ironclad distribution boards from which the power is supplied, either to the individual units concerned or to further distribution boards for the more remote points.

Balancing Networks. By T. G. Partridge, M.I.E.E.

Reduction of losses on distributors

A GREAT deal has been done in recent years to ensure good voltage regulation, automatic or otherwise, up to the low-voltage bus-bars in a sub-station; much has also been written and discussed up to this point. There is yet an important sector to explore more fully, namely, the elimination of waste between the l.v. sub-station bus-bars and the meters on consumers' premises. Without good balance in individual sections of l.v. networks close voltage regulation and high all-round distribution efficiency cannot be achieved.

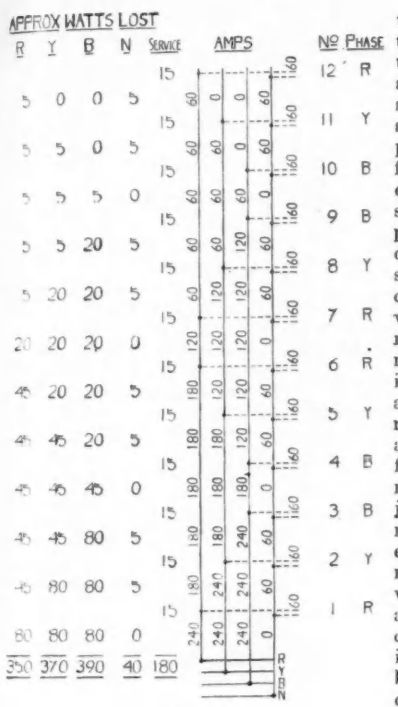


Fig. 1

I here propose to analyse a theoretical distributor, and after this to offer some general observations on the problem, first, for a business quarter, and, secondly, for a purely residential district, both situated in a crowded city, where the demand per square mile is approaching 20,000 kW and the connected load three and a half to four times as much. The object in view is not to try to establish any rule; every network is unique, and the peculiar characteristics are only to be discovered and dealt with by the local engineer concerned. My purpose is rather to stimulate interest, particularly among the large number of capable young engineers who are now entering the rapidly extending field of distribution.

A Theoretical Distributor

Fig. 1 shows a four-core 0.2 sq. in. distributor issuing from a sub-station and fed from the l.v. bus-bars at three-phase, 50 cycles, 400/230 V, the neutral being earthed. The distributor (p.i.l.c., s.w.a.) cable is 120 yd. long and drawn into ducts. Twelve services are connected at ten-yard intervals. Each service is five yards in length and consists of twin 0.06 sq. in. cable of the same type drawn into w.i. piping from a joint (pavement) box outside to service cut-outs inside the premises. The demand is 60 A in each instance. Four services are connected to each phase, and the total demand at the sub-station end is 240 A on each phase, a perfect balance with no current flowing there in the neutral conductor.

	SERVICE Nº & PHASE 1 2 3 4 5 6 7 8 9 10 11 12	APPROX WATTS LOST R	Y	B	N	SERVICES	TOTAL
A	R Y B B Y R R Y B B Y R	350	370	390	40	180	1330
B	B Y R B Y R B Y R B Y R	450	370	290	40	180	1330
C	B Y B R Y R B Y B R Y R	500	370	260	70	180	1380
D	R B Y Y Y B R R Y B B R	390	325	425	85	180	1405
E	R B Y Y Y R R B B B Y R	350	335	455	85	180	1405
F	R R Y B Y B B Y B Y R R	310	400	440	100	180	1430
G	R Y Y R B B B B R Y Y R	330	350	470	100	180	1430
H	R R Y Y B B B B Y Y R R	310	390	470	130	180	1480
I	B B Y Y R R B B Y Y R R	550	390	230	130	180	1480
J	B B B Y Y Y R R R Y R B	635	405	190	222	180	1632
K	B Y B B Y B R Y R R Y R	680	370	200	255	180	1685
L	B B B B Y Y Y Y R R R R	790	470	150	489	180	2079
M	ALL BALANCED ON 3 PHASES	362	362	362	0	40	1126

SEQUENCE

Fig. 2

It is assumed that the power factor is unity and that harmonics or any other disturbing influences are absent. The diagram shows the currents flowing in the conductors of the four-core cable on each 10-yd. bay between service joint boxes. The approximate watts lost, varying as the square of the current, are tabulated against the respective bays and services.

Out of the many ways in which phases could be chosen for the individual services the one selected — RYB, BYR, RYB, BYR—appears to give the best result, as in this instance the total watts lost on the phase conductors are nearly equal, and the losses on and the displacement of the neutral appear to be a minimum under the conditions of loading specified. Another important consideration is that good balance would be maintained if an additional sub-station were installed near service No. 12, the distributor then being fed at both ends. Calling the order of phases shown in fig. 1 sequence "A," eleven random sequences B to L on the same conditions are shown in the table.

[Elliott & Fry

Mr. T. G. Partridge is in the Mains Department of the Westminster Electric Supply Corporation, Ltd.

It will be seen from Fig. 2 that example "M," where each service is balanced at 20 A per phase (the service only being altered to a four-core 0.0225 sq. in. cable) gives the most favourable results from a supply point of view, but the 1934 Electricity Regulations prescribe a single-phase supply up to 15 kW.

In a Business Quarter

There appears to be an impression in some directions that we are, for the most part, pouring electricity into a sort of whirlpool network with no stable characteristics, and that consumers are at odd times switching apparatus on and off. It does not seem logical to be quite so pessimistic in a business quarter. It pays to take readings regularly and so find how much less readings vary from day to day than one might expect.

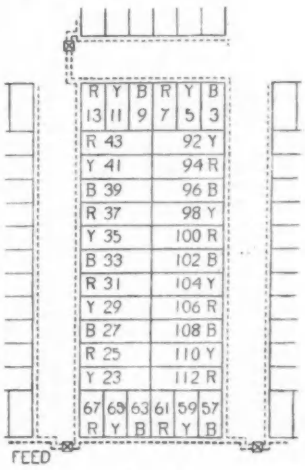


Fig. 3

In any business house, office, shop, restaurant, warehouse, &c., the hours of work are regular and the staff is constant. Whatever demand for electricity is made one working day is likely to be closely repeated the next day, provided similar weather conditions prevail. Most managers, in fact, keep a close eye on electricity consumption, and meter readings for the week or month are carefully checked. Though we are constantly reviling our weather, we do not have many abnormal days. It follows that the most valuable readings for balancing purposes are those taken when the weather is normal. As general demand is from 9 a.m. to 6 p.m., section readings taken round about 11 a.m. and 5 p.m. will give useful information. Winter readings from November to February and summer readings from June to August would probably meet the case.

The larger consumers with a connected load exceeding 100 kW are generally served by a transformer on their own premises and do not therefore come on to the l.v. mains outside. The balance on the larger consumers' loads should, however, be checked. This is important as any serious out-of-balance would affect the regulation of the transformer, and its influence on the outside network would not be equal on the three phases.

This would tend to produce appreciable cross-phasing on those sections lying on the normal nodal points of the distributors between the transformer in question and adjacent transformers. Cross-phasing to a certain extent is unavoidable in practice on interconnected l.v. networks, though, of course,

balances on individual sections are looked after. With serious cross-phasing the current in the neutral conductor will exceed the current in any of the phase conductors with increased losses on the distance of overlap.

Balance in Residential Districts

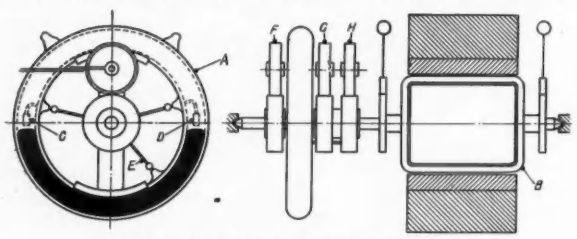
Balancing in residential areas is more difficult to effect, as the diversity of the demand is much more pronounced. Some time ago I instituted the following system, and the results have so far exceeded expectations. The number of the house determines the phase on which it is to be connected. Take the number of the house and divide by three. If the remainder is one, connect to R phase; if it is two, connect to Y phase; if there is no remainder, connect to B phase. A good disposition of the phases is secured whether the houses along a distributor bear odd, even, or consecutive numbers. The distributors are laid to serve every house they pass, the number of transformer sub-stations feeding into the network increasing only as demand develops.

Fig. 3 shows a typical block of houses so served. When circumstances have warranted it there has been no hesitation in making an exception to the normal procedure outlined above. These exceptions (which do not total five per cent.) usually occur in definite dead-end branches, or when a section includes merely the full number of services.

We are out to make every house a distributor passes an "all-electric" one during the next few years. A great deal depends on the lowering of tariffs, and efficiency of distribution is a not inconsiderable factor in the attaining of this desirable object.

Mercury Switch Relays. By J. F. Romer

MERCURY switches, by reason of their ability to break large currents repeatedly without any possibility of the contacts sticking, are particularly suitable for incorporation in relays. The ordinary tubular switch, however, has the peculiarity that when it is tilted slightly the mercury

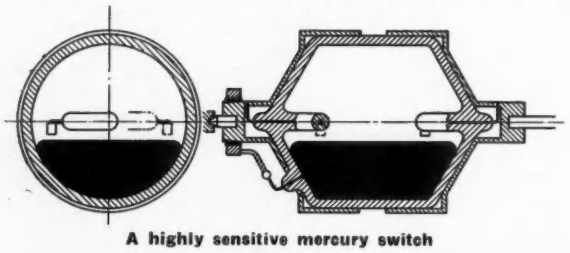


A permanent-magnet moving-coil rectifier

flows right to the end of the tube, completely upsetting the balance and causing a quick make or break. For most purposes this is an advantage, but it renders the ordinary type of switch unsuitable for sensitive relays intended to operate on very slight changes of current or voltage. For such purposes it is necessary for the moving parts to be balanced in all positions, the only turning moment being that provided by the controlling springs. This condition can be attained by using a switch designed in such a way that the tube moves while the mercury remains always stationary.

A permanent magnet moving-coil relay designed on this principle utilises a glass tube A containing the mercury in the form of a ring. It is pivoted exactly at its centre, being carried on a spider fixed to the spindle which also carries the moving coil B. Three contacts, C, D and E, are sealed into the glass at a distance from the surface of the mercury depending upon the sensitivity required. Only two contacts are necessary if the current is not to be reversed. If heavy currents are to be carried, say over 2 A, the contacts are connected to slip rings into which the current is led by copper rollers, F, G and H, carried on spring fingers. For small currents ordinary phosphor bronze springs are sufficient.

A mercury tube of this kind can be used as an a.c. rectifier. If the ring is revolved about its centre by a synchronous motor the contacts will make and break while the mercury remains stationary, the friction being insufficient to carry it round, provided that the speed does not exceed about 600 r.p.m. It is, therefore, only necessary to provide a sufficient number of



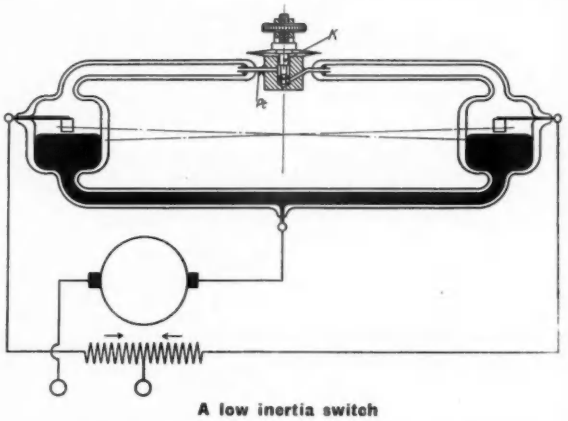
A highly sensitive mercury switch

contacts to be able to rectify current of any ordinary low frequency.

The most suitable metals for the contacts are tungsten or molybdenum. The production of a tubular glass ring requires considerable glass-blowing skill, and in small sizes the ring is not always truly circular as it should be for perfect balance. Hence when the highest sensitivity is required a type of switch is preferable that utilises a glass tube which is diamond turned or ground inside and out, with metal caps fitted to both ends to ensure that the tube will turn concentrically about its axis.

A development originally devised for operating the precession motor of a gyroscope stabilising equipment, but which is also suitable for many other purposes, overcomes the difficulty caused by the inertia of the mercury by using a needle valve K, connected to both ends of the upper glass tube by fine platinum tubes Pt. The space above the mercury is filled with hydrogen. When the tube is tilted slightly the mercury flows into the lower end cistern, driving the hydrogen through the platinum tubes. By suitably adjusting the needle valve the damping can be varied so as to make the movement of the mercury absolutely aperiodic.

The needle is connected to a flexible diaphragm which is soldered to the valve body, the operating screw being on the outside. This prevents any possible leakage of hydrogen. The motor operated by this switch is of the series split field type, the middle of the field coil being connected to one of the supply terminals. Only one-half of the field coil is therefore in use at a time, the polarity of the field magnets and the consequent direction of rotation of the motor depending upon which way the tube is tilted.



A low inertia switch

This switch is really the electrical equivalent of a spirit level, the accuracy attainable depending upon the length of tube, and the distance between the contacts and the surface of the mercury. With a tube 5 ft. long, for example, and a distance of 0.002 in. between contacts and mercury, an angle of tilt of 6.87 seconds of arc can be measured. The apparatus is therefore very suitable for levelling heavy machinery, foundations, and general building work. It can also be used in a slightly modified form as a dip and bank indicator for aeroplanes.

Electric Steel Furnaces in Belgium

An electrical department for the production of special qualities of steel has recently been added to the works of the Société de l'Union des Aciéries at Marcinelle, Belgium, by the Société Belge des Fours Stein, of Liége, in conjunction with the Société des Ateliers de Constructions Electriques de Charleroi. The plant comprises a 2-ton Heroult-type circular furnace, equipped with three vertical electrodes, the charge of metal in the furnace forming the neutral point for the arcs which pass between the electrodes. The latter are made of graphite and have a diameter of 150 mm. (nearly 6 in.). The furnace is so mounted that it can be tipped in two directions, one for charging and one for discharging.

Corrosion Problems. By A. B. Owles, A.I.C.

The effect on iron and steel in power plant

CORROSION may impair the general reliability of power plant by causing leakages in economisers, boilers and superheaters, and damage to turbine blading. A single pithole in an economiser tube can be the means of completely putting the unit out of commission. Corrosion also weakens the crystalline structure of the metal, often where the stresses are greatest. It is increasingly important, with the increasing use of larger power units, that corrosion, particularly pitting, should be minimised. Credit must be paid to the engineer for advance in power plant design and operation, to the metallurgist for the introduction of more resistant materials, and to the chemist for the control and treatment of feed water.

[*Elliott & Fry*

Mr. A. B. Owles is chief chemist at the Barton station of the Manchester Corporation Electricity Department

Corrosion problems can usually be divided into two classes, (1) those concerned internally with the steam-water cycle of operations, and (2) those external dealing with attack by the atmosphere and acid gases.

Even to-day the mechanism of the destructive action of metallic corrosion is imperfectly understood; but it is generally acknowledged that electro-chemical action is the basic principle upon which corrosion problems should be considered. An outstanding worker in this field is Prof. U. R. Evans, of Cambridge, who has advanced an ingenious theory of "differential aeration" for corrosion in liquid media. His key experiment consisted in bubbling air free from carbon dioxide along one of two similar pieces of iron, separated by a diaphragm and suspended in a dilute solution of potassium chloride, each being connected to a milliameter. An electric current was produced and corrosion took place at the anode (negative) or less aerated piece of metal, which showed that attack could be initiated by having different concentrations of oxygen such as can readily be met with in power plant.

There are certain factors which start corrosion, some which undoubtedly stimulate it, and others which inhibit or retard its progress. The question arises as to why the metal should start corroding in isolated areas to produce "pits," which are more difficult to contend with than general wasting. Differential aeration can be one of the causes, although another factor is the presence of certain impurities in the iron and steel such as sulphur, phosphorus and slag inclusions, particularly if in a segregated form. It may also be due to a lack of uniformity of the micro-structure of the metal, or to the effect of stresses. Thus if a piece of steel be bent or hammered, those portions so treated will become electro-negative to surrounding areas under the influence, say, of an undeaerated feed water.

Salts in the water, particularly the chlorides and nitrates, have a stimulating effect on electro-chemical action, and this may become more serious in boilers if excessive concentration of such salts takes place. In addition, the chlorides of magnesia and ammonia are unstable at the temperatures prevailing in boilers, and may impart acidity to the water, with consequent rapid corrosion. Dissolved carbon dioxide also plays an important role by lowering the pH value of the water; in other words, it tends to make it faintly acid. This acid, although very weak, definitely dissolves iron by general rather than by localised attack.

It has long been known that distilled water, if entirely deprived of gases, will not corrode iron and steel, so that one obvious inhibiting factor is efficient deaeration. Again, electro-chemical action is retarded by maintaining the feed water at a pH of over 9.5, *i.e.*, containing some caustic alkali.

During recent years the development of more resistant iron and alloy steels has provided another factor in combating corrosion. The introduction of purer and more homogeneous metal has proved of considerable value, and there are now in use mild steels containing small proportions of copper.

Economiser Troubles

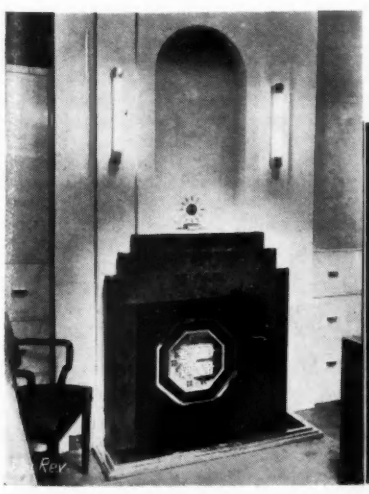
Corrosion in economisers is usually caused by slight acidity in the feed water or by dissolved gases, oxygen and carbon dioxide. The conditions are favourable to differential aeration by reason of the water being gradually heated, and there is the natural tendency for the oxygen to be expelled from solution at the outlet or hottest part of the economiser, with acceleration of attack at the inlet. Most boiler feeds consist of condensed steam with a small proportion of make-up, usually below 5 per cent., so that the quantity of saline matter present is very small and of secondary importance.

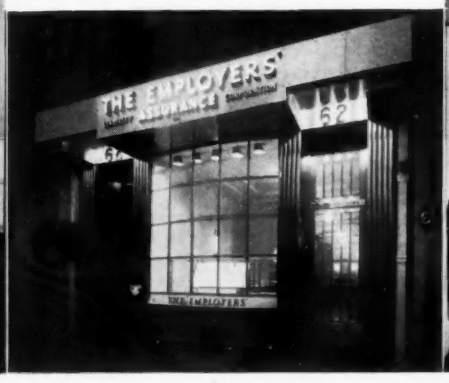
In older plants with open hot-wells it was necessary to use cast-iron tubes of close grain to have the prospect of a reasonably long life. Now, with deaeration, the practice is to employ steel tubes, although the life of these depends largely upon the general control of the process. Steel is more readily attacked than cast iron, and any slight leakage of air may mean intensive attack. Deaerators placed immediately before the feed pump are effective on open feed systems. The principle involved is the boiling of water under reduced pressure, and the cost of doing this has to be balanced against the saving in tube renewals and corrosion in the system generally.

The introduction of the closed feed system some twelve years ago was a big step in preventing corrosion, and deaeration is now established practice. In this system the make-up water is heated and flashed in the condensers, so that the whole feed is efficiently deaerated. The make-up added is in excess of that required, and the surplus feed is forced back to a surge or balance tank situated on the roof.

The oxygen content with the modern feed system is 0.04 c.c. per litre or less, with the old system 3.1 c.c. per litre, and with town's water 6.0 c.c. per litre. Constant vigilance is needed for a closed system, and tests for oxygen should be taken daily, or more frequently, round the plant to detect any ingress of air. Deaerated water has a marked proclivity for dissolving air, and a slight leakage in a casing or gland can easily nullify the good effects of the condenser.

Quite apart from deaeration of the water, it is important





An Up-to-date Assurance Office **(See page 712)**

Left: An "all-electric" fireplace. Centre: The exterior showing the neon sign. Right: The main office

to maintain a definite pH value for the feed. If the make-up water contains a high proportion of dissolved carbon dioxide, this gas will obviously not be reduced to the same extent by the process, as it is about thirty times more soluble in water than oxygen, and where the water is treated with sodium carbonate this may be partly decomposed in the boiler with addition of CO_2 to the system generally.

The Treatment of Boilers

Boiler corrosion can be more easily controlled in modern plant than in the relatively old systems employing open hot-wells with no deaerating process. An examination of many boilers shows that slight general rusting is often found, but this is of very little importance compared with the localised and more intensive type of attack. It is not uncommon to find pitholes in the tubes or at bends, or in crannies and nooks sheltered from the circulation of the water. Boilers that stand for long periods are prone to corrosion due to the ingress of air when the pressure falls below atmospheric. Oxygen then dissolves in the water and corrosion starts in the cavities, tubes, and at places remote from the surface of the water in the drum. Standing units should either be emptied or completely filled with water in which the ratio of caustic soda to sodium chloride has been increased to about five to counteract the combined effect of the salts and oxygen.

This ratio need not be maintained for boilers under load, since the ebullition of steam in the drum efficiently deaerates the incoming water, but the degree of caustic alkalinity must be carefully controlled.

The water should be tested frequently to ensure that the solids do not exceed a certain maximum concentration. The evaporation in modern boilers is so rapid that it is advisable to keep the total solids down to relatively low figures. For boilers of, say, 350 lb. per sq. in. pressure they should be not more than from 100 to 150 grains per gal., but with lower pressures, such as 220 lb. per sq. in., the figure can be raised to 200 grains per gal. It should, however, be emphasised that the quantity largely depends upon the composition of the boiler water and the design of the boiler.

Besides possible corrosion due to concentration of salts, a further danger may be introduced by the caustic embrittlement of steel. This is a distinct form of corrosion which takes place as a result of inter-crystalline penetration by caustic soda, resulting in loss of cohesion between individual grains. Corrosion of this type only occurs when the metal is in a state of high stress, and Parr and Straub found that sulphates and phosphates inhibit the attack. In 1926 the American Society of Engineers recommended that, as a precaution against embrittlement, the ratio of sodium sulphate to the total alkali as sodium carbonate should be two to one for between 150 and 250 lb. per sq. in., and three to one for higher pressures.

Impurities in Superheaters

Conditions in the superheater are quite distinct, since the steam is dried and superheated to temperatures generally in excess of 600 deg. F. Corrosion is caused by impurities, both gaseous and mineral, present in the steam, and these have the greatest effect at the inlet ends of the tubes. At high superheats the action of the steam on the hot metal normally produces a hard thin film of magnetic oxide of iron (Fe_3O_4), which protects it against corrosion. The higher the temperature the greater the dissociation of the steam, with increased formation of the oxide; the prevention of this is a metallurgical problem entailing the employment of more resistant metals.

Salts carried over in the steam can be very detrimental if the boiler water solids contain a high proportion of chlorides and nitrates. Priming is therefore an important factor in superheater corrosion, and even under the best conditions a slight amount of mineral matter is carried forward. The ebullition of steam probably produces a fine spray in the drums of most boilers, but it is hardly priming in the strict sense of the term.

Corrosive products tend to be produced by the decomposition of nitrates and chlorides or by interaction of these salts to form acidic bodies, but by keeping the boiler water sufficiently alkaline any salts carried forward will be associated with a proportion of alkali, which safeguards the superheater. In addition, corrosion is minimised by limiting the concentration of boiler water solids. When trouble occurs it is desirable to make a chemical analysis of any deposits in the superheater tubes and a micro-examination of the metal.

Conditions in Turbines

Corrosion in the turbine is produced under two entirely different sets of conditions, *viz.*, running and standing. In the former the steam at a certain stage becomes " wet," and it is here that corrosive and erosive influences generally exert their maximum effect. The impurities become less concentrated as further expansion takes place, until at the exhaust end of the machine the rate of corrosion is at the minimum. Machines with ordinary steel blades are more likely to be affected, and, in addition, are more prone to oxidation.

The use of stainless steels and other alloys has largely overcome oxidation and corrosion troubles. From an examination of damaged blading it is not easy to differentiate between erosion and corrosion, as the former may have swept away evidence of the latter. The best line of investigation is the feed water and the steam, and, if possible, a sample of condensed steam taken as near as possible to the part of the machine affected. Steam leakages during standing periods sometimes result in serious damage. Moisture condensing on the metal produces fine droplets, which coalesce and run down, collecting in their course any traces of salts deposited during running periods. The drops then become relatively strong solutions, which, in the presence of air, yield spots of corrosion products in the form of small excrescences. In a case like this the spots are swabbed with filter paper wetted with distilled water. The paper is then extracted and tested.

The two main conclusions to be drawn are: (*a*) that efficient deaeration is a reliable safeguard against corrosion; and (*b*) that a make-up water as free as possible from chlorides, nitrates and carbon dioxide is to be desired. Evaporators for preparing make-up water of the desired quality will probably become more common in the future. Conditioning with chemical, if necessary, will then be a relatively simple matter.

Corrosive attacks by the atmosphere and acid gases are of a different character from those mentioned above. Iron or steel in dry air will not corrode, but immediately condensation takes place minute drops are formed on the surface and each initiates a corrosive area underneath itself, with consequent rusting. Corrosion of this type is generally very severe, particularly if traces of chloride derived from the coal are present. Methods to prevent condensation appear to be the best cure.

Domestic Service Fuse Replacements. By F. D. Parker

THE renewal of blown service fuses constitute one of the main duties of domestic service, or fault departments. As many consumers now rely solely on electricity for cooking and water heating purposes, the efficiency of this service is of vital importance, but its cost is often a thorn in the side of many supply authorities. Transport has to be provided, and in large residential areas a twenty-four hour service has to be maintained. To safeguard themselves against any considerable loss, some undertakings impose a renewal charge upon ordinary domestic consumers and shops; others replace their service fuses free of charge irrespective of the nature and cause of the fault.

Judging from present conditions and results, one is prompted to conjecture whether more efficacious methods could not be evolved to deal with the problem, especially with regard to the maintenance of correct balancing between main and sub-circuit fuses. It is also questionable whether the imposition of renewal charges is justified and in the interests of development, for psychological reasons.

At present, contractors possess no knowledge or means of ascertaining the size of main service fuses, and the correct replacement of blown sub-fuses, and more especially sub-main fuses (which are usually incorporated in the main switch), is often a difficult undertaking. Circumstances may easily occur in which such sub-fuses are strengthened to such a degree that the service fuses become the lightest protection in the main circuit.

There are now many appliances with loadings in the neighbourhood of 0.5 kW which are advertised as suitable for use on lighting circuits. An ordinary lighting consumer, for example, may purchase two appliances, such as an electric iron and kettle, or bowl fire. A time arrives when both appliances are in operation simultaneously, which may cause the fuses in the main switch to blow. A contractor is called in, who after ascertaining the kW loading of the installation, strengthens the replaced fuses accordingly. Later on, if the same condition occurs, or the installation develops a fault, the main service fuses may blow instead of the sub-fuses, as they will probably be of smaller section.

The likelihood of this occurrence with many of the smaller types of domestic installations is as obvious as it is undesirable. The strengthening of the sub-fuses in the above circum-

stances is quite permissible, yet it impairs the protection of the installation. The supply authority may also have the expense of attending to its own service fuses, or the consumer may be liable for a renewal fee.

The majority of undertakings inspect and strengthen their service fuses when new heating or cooking apparatus is purchased at their showrooms. On the other hand consumers may obtain such appliances from contractors or general retailers, and connect them without notifying the authority. The latter has also to protect itself against the consumer who attends to his own blown sub-fuses and/or repeatedly connects faulty and unsuitable apparatus. Hence the argument in favour of renewal charges.

Such charges often irritate consumers. It is significant that many undertakings do not adhere rigidly to their regulations in this direction. A serious fault on wiring or apparatus may cause several fuses to blow simultaneously in the same circuit, irrespective of their relative cross sections. Experience has also proved that a severe system "kick" may cause service fuses to blow under "healthy" conditions.

Would it not be in the general interest if supply authorities were to place a notification on the service fuses or board to the effect that replaced sub-fuses must not exceed a certain specified section, and that if this condition is ignored the consumer is liable to pay a renewal charge? Many authorities already issue a similar statement with regard to meter and main service fuse seals. In any case the cost would be negligible compared with the resulting value of such an arrangement. The authority would then possess a clear and defined case for renewal charges if it so desired. Such a scheme would also materially assist in securing the correct protection of installations and wiring. A check could also be kept on the activities of the inefficient contractor.

The time lag before blown service fuses can be replaced is another increasingly important factor, especially with the growing popularity of all-electric houses and flats. The subdivision of large residential districts to enable such faults to be attended to locally could be further explored with advantage. Many supply authorities already utilise this arrangement for housing schemes, when faults are reported during the evening or when the central service department is closed or fully occupied.

A Radio Relay Control. By T. H. Hall

AN interesting control panel designed and constructed by the station engineers is in operation on Mr. Paul Taylor's "Radiomains" wireless relay system at Kettering. The panel can handle dual programmes over six trunk lines and accommodates six 200-W amplifiers. Moving-coil speakers absorbing 150/200 milliwatts are employed on the service but, if the more usual balanced-armature relay speaker were employed, the panel could form a unified control for about 3,000 subscribers. Every link in the whole amplifying system is operated from the panel and when the amplifiers are switched on there is no necessity for the operator to rise from the table.

The programme "mixing" panel is set at an angle of 45 deg. immediately in front of the control engineer. The outputs of six receivers situated in various parts of the building terminate on this panel at 0.5-megohm potentiometers with switches above and below. The lower switches allow the programmes to be heard in the operator's headphones, while the upper switches enable the two selected programmes to be connected to the input of either of the two pre-stage (voltage) amplifiers. The receivers are permanently tuned to selected stations and any of the six programmes can be nicely faded into the service without annoying clicks or breaks in the programme. Indicator lights show which receivers are in use.

The left-hand panel is devoted to line-testing gear, twelve switches enabling any line-to-line resistance and any line-to-earth resistance to be read on a meter calibrated in ohms. The panel is also used for earthing the lines during the night. Although only 75 V is used for testing, a mains transformer giving 200 V is employed; the voltage is stepped down to avoid fluctuation. A metal rectifier and adequate smoothing are incorporated. The indicator lights for the whole panel are supplied from a 4-V winding on the same transformer.

Six monitor-speaker switches occupy the right-hand panel, enabling both programmes to be heard on each of the six trunks through the speaker mounted over the panel.

The large upright sprayed-aluminium panel carries the main control gear. It is divided into six sections, one for each power amplifier, each being identically wired. Each power amplifier input is brought to a 100,000-ohm potentiometer and then to a double-throw switch, enabling it to be connected to the output of either of the two pre-stage amplifiers.

The power amplifier output is taken to the centre contacts of a row of six double-throw switches having the No. 1 programme trunks at their upper contacts and the No. 2 programme trunks at their lower contacts. Each amplifier can thus feed any or all trunks. Indicator lamps, wired in parellel with those on the actual amplifiers, show which sections are "alive" and preclude the possibility of switching into circuit a "dead" amplifier. In the centre of the whole panel each of the twelve trunks is represented by an indicator light which shows whether or not it has a programme. "Burndept" triple-pole double-throw switches are used throughout, the third contacts of each operating the indicator lights.

The Kettering relay system. Left, the control room showing the table and a bank of amplifiers Right, a rear view of the amplifiers

Every possible precaution has been taken in the layout against the introduction of cross-talk (interference between programmes) and so far as is possible internal wiring is carried out in earthed lead-covered cable. All the indicator-light wiring is in lead-covered cable to eliminate a.c. hum. All leads to the panel are carried out in lead-covered cable below the floor, the sheathing being bonded together at the rear of the table and earthed. These leads reappear from the floor under each amplifier and terminate in sockets into which the flex leads from the amplifiers are plugged.

The table is placed in such a position that the control engineer has a clear view of all the amplifiers. He can judge the load by glancing at the output ammeters, avoid distortion by watching the grid micro-ammeters, and detect the failing emission of valves by the anode milliammeters. A telephone on the table enables him to get into touch with wiremen immediately any line fault develops.

Modern Applied Science

Demonstrations at the Royal Society's conversazione

THE display of scientific apparatus at the annual conversazione of the Royal Society, which was held at Burlington House, Piccadilly, on May 9th, included the original revolving lens camera invented by Dr. C. V. Boys in 1900, which has enabled the whole progress of a lightning flash during the time that it lasts to be determined and its speed measured, even if it were faster than light. Photographs obtained with this instrument in South Africa have revealed that the visible portion of a lightning flash travels from the earth towards a cloud upwards along an ionised path previously formed by a downward primary flash which is normally invisible.

An improved method of coating substances with various metals has been developed by the Metropolitan-Vickers Electrical Co., Ltd. The metal is evaporated by electric heating in vacuo, producing a cloud in an atomic state which rises and condenses on to the object to be coated. Thus the latter cannot be pitted by molten droplets or damaged by heat. The coating can be made permanent or applied in such a way as to be easily removable, while its thickness can be controlled down to a mere "blush." In this way aluminium-on-glass optical mirrors have been made with properties much better than those of silver reflectors. Objects liable to tarnish or corrode readily can be given thin transparent protective metal coatings, which can also be deposited on fabrics and paper. In the last-mentioned form the process promises to be the means of constructing fuses for very minute currents.

A portable "Metrovick" noise-measuring instrument functions on the aural balance principle. Attenuators are adjusted until the operator judges the loudness of the note fed from a valve oscillator to a telephone earpiece to be equal to the complex noise, the equivalent value of which is then read in decibels above the threshold from the settings of the attenuators.

The noise meter of Standard Telephones & Cables, Ltd., measures loudness by a subjective method, using an off-set receiver and complex wave reference note, the level of which can be adjusted by an attenuator until the masking point is found.

Exhibits by the Admiralty

The Admiralty exhibited an air flow meter with a displacement diaphragm in the stream which causes an iron armature to move towards one coil and away from another, thereby unbalancing an a.c. bridge; the record is obtained through a full-wave rectifier on a permanent magnet moving-coil instrument calibrated in ft. per minute. Another Admiralty device was a galvanometer with a scale sensitivity of 16 mm. per mA which has been made immune from zero disturbance caused by pitching and tossing by the use of an extremely light coil of a mass of 0.4 grm; a powerful magnetic field of 10,000 gauss; short taut suspensions, each 0.1 in. long and stretched to one-third of the breaking load; and accurate balance.

For enabling deaf people to hear by bone conduction amplified currents from a microphone are supplied to a coil wound direct on to a straight nickel iron wire which has a high magnetostriction coefficient. The wire vibrates with the frequency of the current and the vibrations may be transmitted to the cochlea through the bones of the head or jaw.

Changes brought about in ferromagnetic materials by the application of mechanical strain resulting from tension, pressure or torsion were demonstrated with the aid of a cathode ray oscillograph. Piezo-electric records were exhibited of the pressure-time curves of the pressure pulse from underwater explosions, measured in terms of the charge developed in a tourmaline crystal subjected to the pressure and recorded by a cathode-ray oscillograph. Oscillations set up in the crystal under the impact of the pulse are visible in some records; from these the velocity of the pulse in tourmaline has been determined.

An automatic radio direction finder of the Bellini-Tosi type comprising two crossed frame coils and a goniometer, the search coil of which is rotated by an electric motor, is connected to a radio receiver followed by a special rectifier and relay system which reverses the direction of the electric motor whenever the high frequency current in the search coil increases; thus, since the direction of rotation of the search coil is reversed whenever the minimum is passed, the search coil hunts a position at minimum.

Striking electrical exhibits at Messrs. Wm. Whiteley's London, W.2. Left, the lighting display; right, a variety of domestic appliances

Dr. M. L. Oliphant demonstrated, with the aid of high-voltage equipment supplied by Messrs. Watson & Co., transmutation effects observed when protons and diplons are used to bombard layers of lithium and of heavy hydrogen at potentials up to 100,000 V. Dr. C. D. Ellis and Mr. W. J. Henderson showed the induced radioactivity of light elements, illustrating the production and decay of the new radio-active elements discovered by Joliot and Curie. They were produced by the action of alpha particles from radio-active deposit; in the case of aluminium the quick ejection of the neutron formed a new isotope of phosphorus which decays in a period of about three minutes, demonstrating the nature of the emitted radiation (positrons).

A Cathode-ray Compass

The National Physical Laboratory devised an analogy of the aurora borealis by means of a jet of electrons directed towards a magnetic model of the earth placed within a cathode-ray tube; the deflection experienced by the beam illustrated some of the auroral processes. Since a cathode-ray is deflected by the earth's magnetic field, it can be employed as a compass needle free from inertia. Changes in the magnetic bearing of the platform carrying the tube bend the beam on to one or other of two collector electrodes which take the place of the fluorescent screen. Through the collectors the moving beam is thus caused to actuate coloured lamps or indicators to show divergence from the set course. Changes of a small fraction of a degree can be indicated.

The British Thomson-Houston Co., Ltd., displayed six cabinets which enabled the efficiency and colour distribution of various types of gaseous discharge lamps to be compared with each other and with a standard filament lamp.

The Imperial College of Science exhibited a fractional seconds chronograph designed to record visibly on paper tape, 1/100ths of a second at 1/10th inch scale, up to four events simultaneously. The 1/100ths seconds time scale can be divided by estimation to 1/500th of a second easily. A tuning fork controls a synchronous motor, which through a three-speed gear gives motion to a printing train and paper feed at the selected speed. Four inking pens record any event, translated as a simple make-and-break circuit, which mark on the tape is squared down to the time scale, printed on the tape. The machine is portable, and worked from a 12-V accumulator.

Prof. A. V. Hill and Mr. D. Scott showed how it is possible during continued stimulation by condenser discharges, provided at a constant frequency by a commutator, to vary the capacity of the condenser and simultaneously the potential to which it is charged so as to obtain a constant electric response from a nerve. The relation so found between potential and capacity is in principle the same as the usual strength-duration curve. The effect of previous activity, of frequency and of various physical agents upon it can be determined very simply, and the condenser discharge time can be varied as desired down to a millionth of a second.

Mr. M. J. D. White illustrated the effects of X-rays on chromosomes in mitosis and meiosis, irradiation producing profound disturbances of the cellular physiology.

The Forest Products Research Laboratory is measuring timber cell space ratio, or the ratio of the void volume to the total volume, by determining photo-electrically the amount of light which will pass through a piece of wood. The Building Research Station has made transportable apparatus for recording transient strains in a manner that enables an estimate to be made of the stresses developed in a reinforced concrete pile while it is being driven by impact. A gauge incorporating a piezo-electric crystal is cast in the pile and the potential developed by the crystal is amplified and applied to a cathode-ray oscillograph with a linear time base.

The Fuel Research Station's exhibits illustrated the influence of the type of mill and class of coal upon the nature of powdered fuel, and also methods of rendering pulverised-coal in oil suspensions stable during transport and storage.

Sir Robert Hadfield's specimens of metallurgical interest included flange bolts of "Era 131" steel, containing molybdenum, which have successfully withstood for 2¼ years the severe strain of a pipe line working at a temperature of 875 deg. F. and a pressure of 625 lb. per sq. in. Demonstrations showed the surface magnetic effects in manganese steel caused by decarburisation in heating during manufacture, and the critical influence of temperature in the development by deformation of the magnetic properties of steel.

Expansion Circuit-breakers

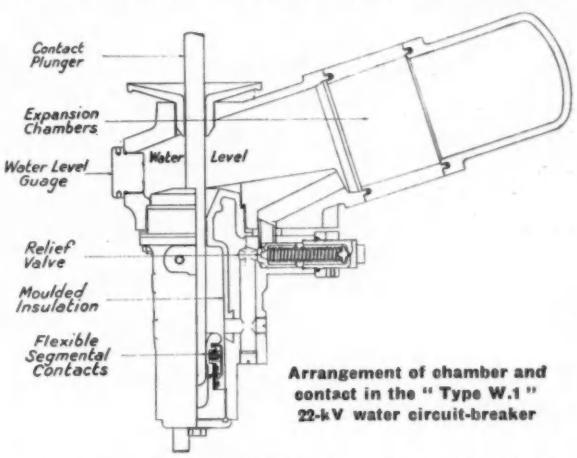
THE theoretical basis of the expansion circuit-breaker was discussed in an article which Dr. Fritz Kisselring contributed to our issue of May 22nd, 1931. The breakers installed at the St. Albans sub-station of the North Metropolitan Electric Power Supply Co., which we inspected this week, are the first of their kind made by a British firm.

The manufacturers, Messrs. Ferguson, Pailin, Ltd., claim that they have the following advantages over certain foreign designs: a greater working factor of safety, permitting a more onerous duty cycle; the ability to operate three times as frequently, with from 100 to 150 normal switching operations, without replenishment of the liquid; dependence on steam jet rather than on de-ionising in the expansion chamber; and a nearly vertical arrangement of insulators supporting the mechanism for the moving contacts and the pressure chamber containing the fixed contacts, thus minimising the cantilever stresses due to the reaction between fixed and moving parts.

These breakers, which are rated at 250,000 kVA at 22 kV, have dealt successfully with 274,000 kVA at 19.3 kV recovery voltage with an applied voltage between phases of 23 kV. In principle the method is that of the old explosion pot but with water as a filling medium and steam as a scavenging agent. The arc, from its inception to the moment at which the "candlestick" leaves the throat of the pressure chamber, produces pressure by the generation of steam. After the candlestick has left the throat the steam leaves the chamber as a high-velocity jet and extinguishes the arc by turbulence, blast effect and scavenging its path.

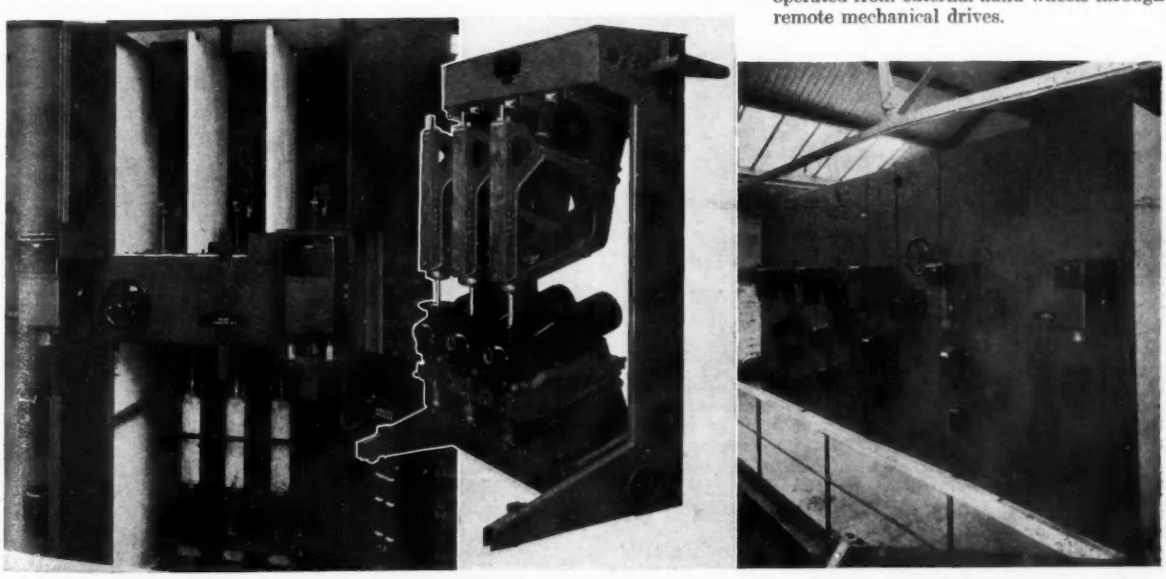
The moving contacts when the switch is tripped move vertically upwards, the action being controlled by accelerating springs. At the end of the opening stroke the movement is arrested by glycerine and water-filled dashpots. The breakers, which are remote electrically controlled, are fitted with F. & P. standard free-handle closing solenoid mechanism in which the closing plunger is coupled to a breaker through a compressed chain coupling link.

As the steam produces an opposing piston effect when the contacts approach one another, powerful and rapid closing is essential. For emergency hand closing, independently of the electrical system, a "Type T.G." thermal gas-closing mechanism is employed; the requisite force is obtained from the rapid gas generation due to battery ignition of gunpowder in a cylinder below a plunger that operates the breaker.



Arrangement of chamber and contact in the "Type W.1" 22-kV water circuit-breaker

The Northmet installation consists of a five-panel, remote electrically operated, moulded-stone phase-segregated cellular switchboard controlling two rotary convertors, one incoming feeder and two interconnector feeders. The bus-bar chambers, isolators, and circuit-breakers occupy the first floor of the cell; underneath are the potential transformers, cable sealing ends and feeder isolators. All isolating switches are gang-operated from external hand-wheels through remote mechanical drives.



Left: A circuit-breaker compartment. Centre: A view of the water breaker. Right: A complete five-panel cellular board

Electrical Progress in India

Important developments during 1933

IN a recent issue of *Electrotechnics*, the official organ of the (India) Electrical Engineering Society, Mr. K. V. Karantha states that the year 1933 saw the successful completion of three large electrical schemes. According to a list compiled by the Electrical Inspector to the Government of the Punjab, the total capital invested in the electrical undertakings in the whole of India up to the end of 1932 amounted to about Rs. 82 crores and the total installed generating capacity of the undertakings to 830,000 kW.

The chief contributions of the past year were the Uhl River hydro-electric scheme in the north and the Pykara system in the south. The former, which took over seven years to complete, has a total installed capacity of 48,000 kW. Though formally inaugurated in March it was supplying power only to a single town, Amritsar, until the end of August. However, by the end of 1933 some thirteen towns were being supplied. Serving an area of 46,000 sq. miles with a population of 1,250,000, the potentialities of the scheme are considerable. The Pykara hydro-electric scheme was completed early in April, the present installed capacity being 18,750 kW. It supplies energy to nine towns and three villages, and has already a connected load of about 6,000 h.p.

Oil-engine Plant

In addition, individual Diesel engine stations were provided for a number of small towns, and a hydro-electric installation was also completed at Maymyo, in Burmah. A noteworthy example of the former is the Diesel power house at Tuticorin with an installed capacity of 1,200 kW for serving the three towns, Tuticorin, Tinnevelly, and Palamcottah, each with a population of about 50,000. The last two towns are being fed by a 30-mile 22-kV transmission line from the power house at Tuticorin. This scheme has been the forerunner of at least two other similar schemes (the South Arcot and the East Tanjore electricity supply companies) for which licences have now been taken out with provision for 22-kV transmission lines.

The headworks area of the Uhl River scheme. The picture gives some idea of the nature of the surrounding country

In the Madras Presidency forty-one towns have so far been electrified and schemes for the electrification of thirteen more are in hand. There is now hardly any town of importance in the Presidency which has not yet been electrified or the electrification of which is not under consideration. This is equally true of the Bombay Presidency and will soon apply also to the area covered by the first stage of the Uhl River scheme.

New Works in Progress

During the year electricity supply undertakings continued to enjoy the confidence of the investing public and new supply schemes are therefore being developed in all parts of India. In Travancore State work has started on the Pallivasal scheme, which provides for the establishment of a 10,000-kVA hydro-electric station and the erection of 208 miles of transmission and distribution lines. The scheme is expected to be completed in 1936. Work on the extension of the Pykara system to Trichinopoly may be expected to commence shortly.

The Madras Government has now completed its investigation of hydro-electric schemes in the Presidency capable of economical development. They total thirteen in number and 521,000 h.p. in capacity; of these the Pykara scheme (100,000 h.p.) is the largest and the Godavari scheme (1,000 h.p.) the smallest). It is expected that the Mettur project will be the one to be taken up next. The initial plant will have a capacity of 33,000 h.p., and it is proposed to supply energy to Madras from this plant in five years. The Nepal Government has undertaken the construction of a large hydro-electric plant at Sunderjal, ten miles from Katmandu. The Kolhapur State is considering the possibilities of a big hydro-electric project for the development of about 50,000 h.p. at Radhanagiri. Gauging operations for the purpose of harnessing the Gersoppa Falls in the Western Ghats are now being conducted by the Mysore State and the Bombay Government. The Calcutta Electric Supply Corporation is arranging to supply, within a year, electrical energy to Baidyabati and the surrounding districts.

Traction and Telephony

The Delhi Electric Supply and Tramway Co. has decided to introduce trolley buses in certain parts of Delhi; these will be the first of their kind to be used in India. The introduction of trolley buses in certain parts of Rangoon and Calcutta is also under consideration. The Standing Finance Committee of Railways for India recently sanctioned the purchase of two 800-h.p. main-line Diesel-electric locomotives for experimental purposes. They will be used on the Sukkur-Sibi and Lahore-Karachi sections of the North-Western Railway, where coal is expensive and water scarce.

As regards wireless telegraphy and telephony, the radio-telephone service between India and England inaugurated in May was the most outstanding development of the past year. There has also been extensive development by way of linking up various towns in India by trunk telephone lines and these two together have made it possible for many important towns in India to get into communication with England or, through the British radio-telephone service, with other continents. Amongst the schemes now in hand for further extensions of the trunk telephone systems is one for the linking up of Madras and Rangoon by radio telephony and another for extending the telephone lines to Ceylon. The beam wireless telegraph service between India and Japan has been operating successfully.

Manufacture and Tariffs

In Bangalore the Mysore Government has successfully built and put into operation a number of distribution transformers in sizes up to 50 kVA and for voltages up to 35,000. The progress of the Government porcelain factory at Bangalore is also stated to be satisfactory. At Agra a new company, known as the Hindustan Electric Lamp Works, has been formed for the manufacture of glass bulbs and other goods. Another factory started in Calcutta in 1930 has now completed arrangements for manufacturing flashlight torches on a large scale. Dry batteries for torchlights are also now being made in a number of places in India.

In concluding his review Mr. Karantha remarks that it should not be concluded that the progress made during 1933 by the electrical industry in India is quite satisfactory. The effect of the supertax on electricity in the Bombay Presidency has made its baneful effect heavily felt. Domestic consumers are said to be curtailing the use of electricity to within the limits free of taxation, and instances of consumers having gone off the mains are reported. In Bengal the trade depression has reduced the consumption of electricity.

In Calcutta and other places where reduced tariffs have been introduced, the response of the public has not come up to expectation, due to need for economy everywhere. The condition of the cotton industry, which is a big consumer of electricity, is also unsatisfactory.

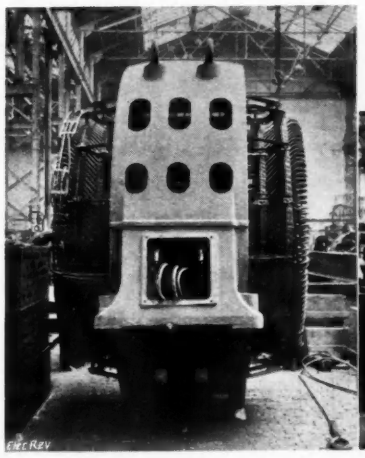
The number of new towns eager to be electrified is rapidly increasing, but supply companies are not finding it easy to raise the necessary capital.

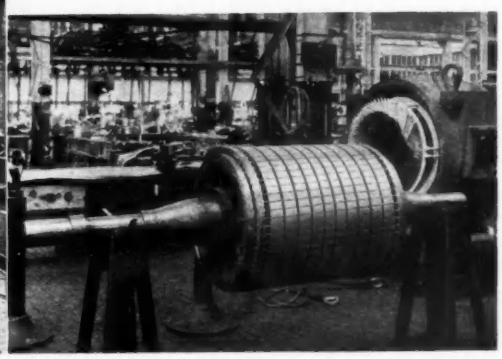
Motor Developments

A review of recent productions of Messrs. Mather and Platt, Ltd.

DURING a recent tour of the electrical shops of Messrs. Mather & Platt, Ltd., Manchester, under the guidance of the chief electrical engineer, we saw and heard much of interest in connection with the company's recent developments, including the production of motors in sizes of from ¼ h.p. to 5,000 h.p.

One new departure is the introduction of fractional h.p. motors to serve other than domestic equipment, the smallest M. & P. machines being produced for driving the company's "Thermolier" unit heaters. Because they are called upon to run for long periods under conditions of utter neglect, often in close proximity to hot steam pipes, and are required to start and stop many times a day, they are built on very much heavier lines than the ordinary commercial fractional h.p. motor, the methods of insulation and impregnation being identical with those employed for much larger machines. They are also designed for the quietest possible running and starting. Being single-phase induction motors of the capacitor type, *i.e.*, with a small condenser connected in series with one phase of the 2-phase stator winding, the motors have the necessary starting torque, but, since the condenser is left permanently in circuit, the running efficiency is improved considerably and the overall power factor is raised to approximately unity.

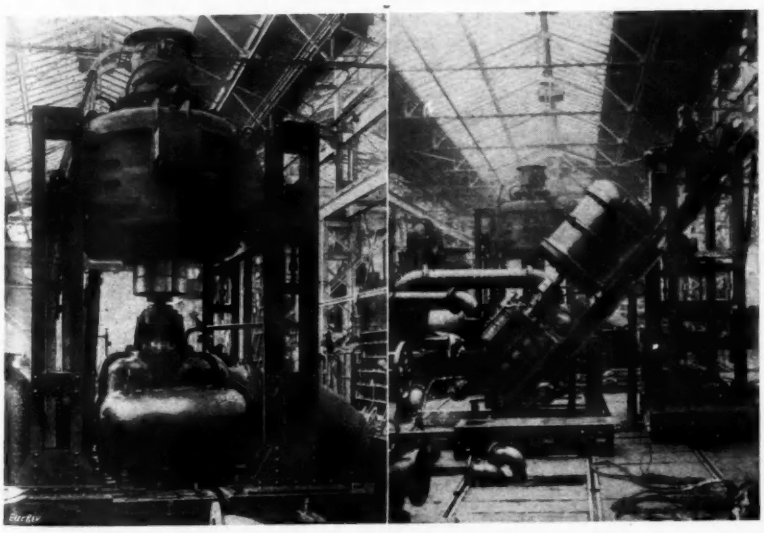




Left: A 4,000-b.h.p., 11,000-V motor showing the double bracing back of the stator winding. Below: A double squirrel-cage rotor

One of the largest equipments of the company is a wound rotor induction motor of 4,500 b.h.p., 11,000 V, 750 r.p.m., produced for the Coatbridge, Glasgow, tube works of Messrs. Stewarts & Lloyds, Ltd. It is the driving portion of a motor-generator set made by the company with three 500-V direct-current generators, all coupled in line and on a common bedplate with the motor, each having a normal continuous capacity of 1,000 kW, and being designed to carry a peak load of 2,000 kW.

We saw the main components of two vertical motor pumping units which are being produced for the Madras Corporation. Each motor is a 575-b.h.p., 3-phase, 50-cycle, 5,000-V, 600-r.p.m. salient-pole machine arranged for auto-transformer starting and carrying a small exciter on the end of the vertical shaft. An unusual feature is the rigid support afforded by casting the supporting brackets solid with the stator frame.



Left: One of the Madras pumping sets on test directly coupled without the shaft. Right: Portable tilting pumping set for mining work overseas

Pumps for Mining Work

A tilting motor pumping set for mining work overseas is designed to operate in any position from horizontal to 48 deg. from the horizontal. The motor is of 115 b.h.p., 1,500 r.p.m., 2,200 V, 50 cycles, 3 phase, and its star-delta starting is unusual for such a high-voltage machine. The oil-immersed starting gear is suspended on trunnions in such a manner that it remains vertical whatever the angle of inclination of the set. The whole set is portable and mounted on the base on wheels, and it can be lowered down the incline as required for "unwatering." The bearings are arranged to take their own thrusts separately, no thrust being transmitted through the coupling. Rotary-convertor work is obviously not dead yet, for, *inter alia*, we saw 200-kW and 500-kW sets under construction, and a 750-kW set designed for inverted running.

Perhaps the principal items of interest concerning the variable-speed a.c. commutator motors which we saw under construction are the heavily built end cover at the commutator end and the rigidly supported brush gear mounted inside. Messrs. Mather & Platt have very strong views on brush-gear design, and aim at simplicity, rigidity and a minimum of moving parts. In the standard M. & P. design the cast-brass brush boxes are mounted on a solid iron casting in which is incorporated a stiffening web through which is carried the adjusting screw secured to one end of each spiral pressure brush spring. At the other end of each spring is fixed a bakelite peg which engages with the brush. Four standard brush springs are employed, differing in appearance but interchangeable as regards dimensions. Each standard spring is of definite known compressibility so that it is a simple matter to adjust the pressure on every brush to the correct working value.

Sound D.C. Design

The main feature of a pair of 230-h.p., 440-V, 1,700 to 2,100-r.p.m., d.c. motors is that with the wide speed variation on top of the high initial speed the machines are still within the limits of sound electrical and mechanical design, although the high speed has rendered necessary a number of special features. In particular, the brush gear is of unusually rigid design for a machine of these dimensions, and it is supported from the magnet frame instead of from the bearing. The motors are to drive boiler feed pumps. The speed variation is actually wider than is usually required for a boiler feed pump, in order that the boilers can be operated for a time at less than the ultimate pressure.

Typical of high-reactance s.c. motors which the company is building for direct full-voltage starting, with starting currents of about four times full-load current, or even less when necessary, is one for boiler feed pump work. It is of 250 b.h.p. and runs at 3,000 r.p.m.

These high reactance motors are quite distinct in design from the high-torque squirrel-cage motors designed for heavy starting duties, which usually give about twice full-load torque with starting currents of the order of 4 to 4½ times full load current.

The company's extensive pump business serves it particularly well in connection with the production of s.c. motors.

The starting torque is so low that the s.c. motor fits in very well. Our guide said that there are nowadays very few pumping installations which cannot be dealt with by s.c. motors. In many of the larger installations the simplest, cheapest and most reliable method of starting is to switch directly on to the line at full volts. By suitable design the starting current can be kept down to less than four times the full-load current, and, where starting is light, without introducing a high torque rotor of the double cage or equivalent type. The double squirrel-cage rotor, by the way, is quite a speciality of these shops. Motors of this type having an output of 1,000 h.p., were brought to our notice, but there is in fact no limit to the size which can be constructed.

High-speed Salient-pole Machines

A little historical information was given us in connection with some salient-pole alternators that we saw. When direct-coupled turbo-alternators were first introduced salient-pole machines for 1,500 r.p.m. were frequently employed. As turbine sizes and speeds increased alternators had to run at 3,000 r.p.m., and the four-pole salient-pole machine went out of favour. Then the gear-driven turbo-alternator came along with speeds up to 1,000 r.p.m., and even, in moderate sizes, up to 1,500 r.p.m., so that the high-speed salient-pole machine has returned to useful service in sizes up to 3,000 kW or more.

The company's engineers are particularly proud of the insulating methods employed. In high-voltage windings the coil ends are insulated before the slot portion. The moulded mica insulation of the slot portion is wrapped so that it tapers off at the ends, keeping the total thickness of insulation uniform and preserving a long overlap which is thoroughly sealed. Another important point stressed is the use of mica insulation for windings of all voltages, sizes and types.

In all h.p. stators with overhung windings the winding ends are braced back to single or double solid supports. Compound wound field coils for standard d.c. motors have the series coils wound separately from the shunt and supported quite clear of the shunt coils by moulded bakelite clamps.

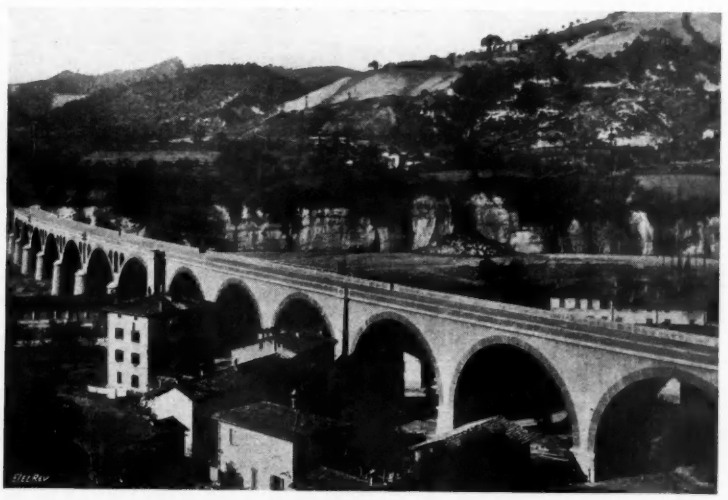
The Florence-Bologna Electric Railway

An 18½-km. tunnel through the Apennines

THE inauguration of the new direct electric railway between Florence and Bologna on April 22nd, was an important event for the Italian railways. It will reduce the journey time from Milan to Naples to ten hours, shorten the journey from Trieste and Venice to Rome by two hours, and, even over the Sarzana route, the trip from Milan to Rome will be reduced by one hour.

Moreover, the express Italian steamship services to Egypt, British India, and China, which are much dependent on the organisation of the railway services, will benefit from the fact that there has been established an express train from Milan to Naples in connection with the sailing of the Lloyd Triestino motor liner *Victoria* from Naples to Bombay, which will save three or four hours in the crossing of Italy. Thus the new direct electric railway between Florence and Bologna will reduce the duration of the whole trip from London or Paris to Alexandria or to Bombay, making the Italian route much more attractive to long-distance travellers than at present.

The importance of the new line from the technical point of view is such that it can be said without danger of exaggeration that it is the most important railway built in Europe in the course of the past few years. Of the 97 km. of new line 37 km. is in tunnels of various length, the longest of which is the 18½-km. tunnel through the Apennines, in which the line reaches its highest point above the sea level, about 322 metres against the 616 metres reached on the old Bologna-Bagni della Porretta-Pistoia-Prato-Florence line, which has been in operation since 1860 and was electrified in 1929. From this point the line is downhill throughout to Florence.



The Vado Viaduct on the Florence-Bologna railway

For the construction of tunnels it has been necessary to dig out 1,510,000 cu. m. of rock, to employ 440,000 cu. m. of mortar, and to consume 113,000,000 kWh of electrical energy for the operation of the mechanical plant. Besides the various constructional yards which had to be built, the engineers have had to fight against dangerous gas and against strong water springs, some of which yielded 300 litres per second.

The Italian State Railways Administration built 49 km. of narrow-gauge service railways, telfer plants, power plants, &c., the construction of which cost about 17 million lire. Furthermore, the considerable lengths of the tunnels, and the high speed at which trains are to travel on the new line (stated to be 140 km. per hour) have made it necessary to build between tunnels a service station, consisting of a building and four tracks, on which to hold up the slower trains while precedence is given to the fast trains. The line starts from the southern end of the Bologna railway station, which is being enlarged, and terminates in the Prato station of the old Bologna-Porretta-Pistoia line, 14 km. from Florence. The new electric railway is 97 km. in length, while the old line measures 131 km. The gradients do not exceed 12 per cent. on the open and 8 per cent. in the tunnels, while the curves are not of smaller radius than 600 metres.

The new line includes 1,200 metres of viaducts, among which there are some about 300 metres in length, and 700 metres of bridges. There are seven stations, all provided with extensive tracks operated on the automatic electric block system. The old Prato station has been replaced by an entirely new terminus.

For telegraph and telephone services a special cable has been provided, consisting of six double pairs of wire in the middle and of sixteen pairs of wire at the periphery, and in every station electric control apparatus has been provided for the operation of the rail points and of the signals. The stations are illuminated by two or more lighthouses mounted on towers of concrete or iron, and the three larger tunnels (Appenines, Monte Adone, and Pian di Setta) are to be lighted by powerful lamps spaced at about 800 metres.

The new line is operated with d.c. at 3,000 V, supplied in the form of three phase at 60,000 V from the distribution centre of Bologna, the sub-station of Bologna San Viola, and from the Italian State Railways Administration plant situated in the upper valley of the Reno river. For the feeding of the contact line, from which the electric locomotives will collect energy, five sub-stations are to be built, 30 km. apart, equipped with the necessary transformers and mercury-vapour rectifiers.

Most of the bridges along the new lines are of concrete, and the hardest type of stone has been employed in walling the tunnels, in which special precautions have been taken to prevent leakage of water, and to ensure the highest ventilation by the use of compressed air plants driven by electricity.

New express trains are to be run between Northern and Southern Italy, which are to take about eight hours and twenty minutes from Milan to Rome against eleven hours or more at present, and the Italian State Railways Administration is to place in operation a new type of first-class passenger car of larger dimensions and of greater convenience than those at present in service.

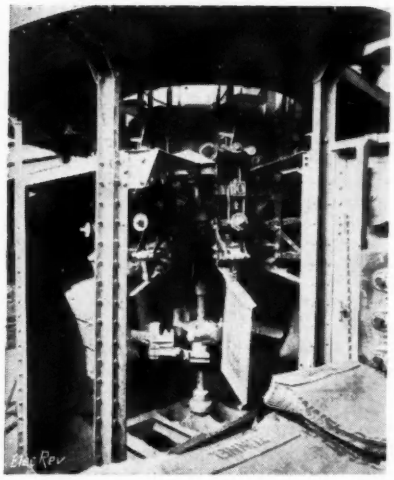
The total cost of the scheme will exceed 1,300 million lire, and the greater part of the work has been completed in the past twelve years.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Power Factor Improvement

Referring to the article on this subject in your issue of May 4th, it is incorrect to state that the size of the condenser will be twice as large for 400 volts as for 600 volts. This statement may have been true years ago, but is not true to-day, when different dielectric thicknesses are used for different working voltages in such a way as to keep the voltage stress approximately constant for any given operating voltage.



An electro-pneumatic sack-filling machine at the Tunnel Portland Cement Co.'s works (See page 694)

As for power factor correction by condensers, there must be a reduction in current, so that, in view of the known reliability of modern motors and condensers, it is possible without risk to use cables of reduced area due to the improvement in power factor. The remarks in the last paragraph of the article may apply legitimately to certain special forms of motors with internal correction of power factor, but should not apply in the case of condensers used with induction motors in the normal way.

A. E. BENNETT.

London, W.3, *May 14th.*

What (and When) is Ohm's Law?

I was shocked to see in the editorial notes in the ELECTRICAL REVIEW of May 4th, "that certain conditions to which Ohm's law is inapplicable obtain to-day"! One is tempted to ask "Since when?" Unfortunately it is no novelty to hear eminent people talk about conductors to which Ohm's law does not apply and it is time that such looseness should cease. Ohm's law in its simplicity says that the current in a circuit is the quotient of the e.m.f. acting round that circuit and the resistance of that circuit. I venture to say that there are no exceptions to that statement; if there are our calculations must go astray.

Ohm's law makes no assertion about the constancy or otherwise of the resistance of a circuit or of any part of it. That will vary with conditions, temperature, frequency, and shape of section in the case of alternating current; even a copper conductor carrying a current changes its resistance as it warms up. Ohm's law applies at every and any instant; resistance may change between instants. Please help to squash inexact language.

HENRY M. SAYERS.

Streatham, S.W.16, *May 14th.*

The Perfect Conductor

In your editorial comment on Prof. M'Lennan's Kelvin Lecture before the Institution of Electrical Engineers you make the following remarks: "To find that . . . ohmic resistance suddenly ceases . . . is startling, but the continued flow of current . . . after the withdrawal of the e.m.f. which initiated it is another matter."

This and other phrases in your article give me an excuse for ventilating an idea that has long been impressed on my mind by much experience, namely, that a large proportion of those who deal with electrical things more or less intelligently do so without ever getting a clear idea of the meaning of Ohm's law and of "resistance."

I am afraid that the blame for this state of things must be laid at the door of those who teach the "young idea" in our schools and colleges. Ask a budding electrician "What is Ohm's law?" and he will reply $C=E/R$, or if he has been more carefully instructed he may say $V/I=R$. Now ask "What is resistance?" and more often than not he can give no intelligent answer. He has not been made to realise that the statement that "V/I is a constant ratio" (strictly Ohm's law) applies only in certain specified conditions. Nor perhaps has he realised that when we say that V/I equals R, R is a measure of a property possessed by all conductors under normal conditions—the property in virtue of which the conductor is *heated* by the passage of *any* electricity in *any* direction through it.

If no electrical energy is turned into heat in the conductor this has no resistance. Also if electrical energy is turned into any other form than heat, then V/I is not equal to R, or, in common parlance, the conductor "does not obey Ohm's law." On the other hand, the expression "Ohm's law" is often used to indicate the general relationship $V/I=R$, $V=IR$, and it may be said that if a current I passes through any conductor of resistance R Ohm's law tells us that a voltage $V=IR$ will be "used up" in producing heat in the conductor, whether other forms of energy are developed in it or no. In this sense there are no conductors which do not obey Ohm's law. It seems obvious that confusion and loose thinking may arise unless the proper meaning of (ohmic) resistance is firmly implanted.

Reverting to the quotation from your editorial comments, it seems to me that if the ohmic resistance of a conductor disappears under any special condition the persistence of a current in it when once started is not "another matter"—but an obvious corollary. It goes on, just as we go on round the sun (as Sir Oliver Lodge would say) because there is nothing to stop it.

R. A. WEST, A.M.I.E.E.

Eltham, *May 8th.*

Radiant Electric Fires

Can any of your advertisers or readers state which was the earliest *bright red heat* radiant electric fire put on the market, its manufacturer, and the date? I fancy that Messrs. Belling, Ferranti or Arora were first in the field.

Apparently until the nickel-chromium heating alloy was invented such fires were not practicable and lamp-type radiators were the only possible type of radiant electric heater.

May 9th. INQUIRER.

"Electrical Technology"

I think that your review of my book "Electrical Technology" which appears in the current issue of your journal seriously misrepresents the scope and purpose of the work. Your reviewer takes the trouble to point out that the book "does not go far enough for the final examinations of the City and Guilds Institute nor for the Higher National Certificate in Electrical Engineering." This surely would lead a reader of the review to imagine that I had unsuccessfully attempted to cover these syllabuses, but in my preface I state specifically that the book "will be found suitable for students studying for the graduateship examination of the Institution of Electrical Engineers and the Grade II examination in electrical engineering of the City and Guilds of London Institute." I make no claim with regard to the other examinations mentioned by your reviewer.

The reviewer's comments are practically confined to two chapters, although the contents of two others are briefly referred to in passing. As there are twenty chapters in the book, a review on these lines is definitely unbalanced. The alternating current section of ten chapters is not even mentioned—indeed a reader of the review would certainly conclude that the book was devoted to direct current only. This is a

The new pavilion at Colwyn Bay, which was opened last week, lends itself well to floodlighting

misconception which I am particularly anxious should be corrected, as I have given special attention to this feature of the book in the preface. My treatment of the elements of a.c. theory, particularly with respect to vector diagrams and symbolic notation has, in fact, been highly commended by a number of reviewers and other persons of undoubted technical standing.

I have intentionally refrained from discussing the technical aspects of the criticism, since, however profoundly I disagree with them, I can appreciate that these may be an honest expression of the reviewer's personal opinions. I would be very grateful, however, if you would give the above points concerning the scope of the textbook a publicity equal to that of the original review so that any wrong impressions may be corrected. W. L. HORWOOD.

Hillingdon, Mddx., *May 15th.*

Main Switch Control

I regret I did not make myself quite clear in my letter of April 28th. I was referring to a two-wire service supply at 230 V a.c. for lighting purposes only.

The first intimation I had on the subject was when I proposed to install an ordinary 10-A d.p. switch-splitter fuse to control six lighting points and a radio plug point. The total loading was about 1 kW. I was then advised that " splitters " were not allowed on the a.c. supply, a combined d.p. switch-fuse not being permissible, and that the main switch control must be by a d.p. linked switch and s.p. fuse on the live side with a link on the other. My system was perfectly standard—the whole of the proposed wiring being carried out in c.t.s. (twin).

For a service main giving a single-phase three-wire supply or three-phase four-wire supply of course one would not dream of fusing the neutral at the main switch. On the other hand, one could have bus-bar chambers or a main s.p. multi-phase fuseboard with neutral bus-bar controlling ordinary d.p. distribution boards for installations that it was necessary to balance.

This, however, is not the point in question. The question is purely whether any supply authority can refuse to connect up a wiring installation carried out strictly in accordance with the existing I.E.E. Regulations—if supplied by means of a two-wire service and controlled by a d.p. combined switch fuse or splitter as specified under Rule 94—" Control of Supply." D (a). CHAS. E. GRAY.

Lowestoft, *May 12th.*

Improvements in Distribution

One of the main complaints of the layman against electrical schemes is that the unsightly way in which wires are slung across streets, and the rough and slap-dash methods adopted by many urban supply undertakings in South Wales in leading in the service wiring do not compare at all favourably with gas servicing and prejudice laymen against our industry. Yet this untidy work is quite unnecessary.

I have seen poles with half a dozen services feeding from them. Each service goes to a separate pair of insulators, and, instead of a service neatly clipped to the wall, there is another pair of insulators over the door-frame with the service wires coming down the wall by way of these two sets of insulators.

If an overhead line runs through a street of a hundred houses it does not require much more material to service the block at each end and then to cleat a twin feed wire along the back of the houses, each service feeding half the block. Once this is done all the services can be run in at the back of the houses and the whole job looks neat. Service wires from the cleated feed wire should be lead-covered, because the use of this type of cable prevents the " tapping " of current, which is a source of considerable worry to engineers in some of our depressed areas; if a pin is stuck into the lead to bridge the meter the puncture will always be visible, even if a short-circuit is not caused. The wall should be plugged and the lead-covered cable clipped to the wall either with cable clips or lead strips.

One difficulty with the cleating of the feed wires is that the average type of cleat is not always suitable; a metal clip suitable for a twin rubber-covered cable should be available. When the cable enters the cut-outs it should be brought in at the back of the cut-out board and the lead bared back so as to be concealed by the board.

Another point of criticism is that many engineers will not put the meter in the position desired by the consumer, on the ground that they must not take the " live " mains far into the building. This difficulty can be overcome by fixing the service cut-outs at the nearest point of entry on a separate board, and then continuing the mains to the meter at the point desired by the consumer. This method would also get over the oft-repeated complaint that the meter, when fixed over a door, " drops " on occasions when the door is violently closed.

A further advantage of using cut-outs fixed on a separate board is that the service can be brought in at the upper storey windows; this obviates the necessity of plugging the outside wall, which is generally cemented, entailing a good deal of work. Furthermore, the cable is largely protected against mechanical damage and weather conditions.

By a little foresight and effort many of these minor faults can be avoided, producing a better and more favourable attitude towards electrical expansion. WM. DAVIES.

Pontllanfraith, Mon, *May 9th.*

Contractors and Supply Authorities

Mr. W. G. Shaw's letter in your issue of May 4th is aggressive without reason and I venture to point out weaknesses in his arguments.

For the existence of a friendly feeling between contractors and supply authorities it is necessary first to have friendly feeling between the units comprising each group. Whilst there is evidence of such feeling between the supply authorities I regret to say I have still to find evidence of it between contractors. On the contrary I have found enmity and petty jealousy, and these feelings have seriously interfered with my efforts to co-operate with them. Mr. Shaw states " the contractor is the unpaid canvasser of the supply authority." I should like to know the date when contractors began to do something for nothing. I should also like to say that in my experience I have found the majority of contractors have been ready to wait for work to be passed to them by a supply authority, but only a small minority have bothered to look for work for themselves.

From the closing paragraphs of his letter I conclude that Mr. Shaw is an old-established contractor, in which case it is difficult to understand the ignorance displayed in the preceding paragraph where he refers to " their high-priced commodity "—" getting on with the supplying of current at a reasonable figure "—" unlimited supply of capital in the shape of ratepayers' money." Has he not yet discovered that electricity is about the only commodity which is cheaper now than it was before the war? Has he not realised that the capital used by supply authorities is subscribed by the general public in the form of loans on which interest is paid and which are repaid in a prescribed period?

This is the usual way of carrying on extensive businesses, the principal difference being that supply authorities are not allowed to introduce artificial conditions by spreading the loan repayments over excessively long periods. Finally, has he not noticed that many electricity undertakings, whilst paying rates on extremely high assessments, are also subsidising the general body of ratepayers by virtue of the sums extracted from electricity profits for " relief of rates "?

It seems to me that the present rapid progress of the electricity supply industry demands equally rapid development of the contracting business, and if contractors cannot adapt themselves to these conditions they must not grumble because progressive supply engineers are showing them how to do it. My idea of a solution is for contractors to get together with a view to showing what initiative there is in them rather than with a view to defending " rights " which they do not possess. If they can produce a policy which is capable of keeping the contracting business in line with the supply business I feel sure they will receive the sympathetic support of most supply engineers. ASHES.

May 10th.

Flameproof Switchgear

I was interested to read the leaderette in your last issue regarding flameproof enclosures for fume-laden atmospheres, such as obtain in artificial silk factories and the like. It is alarmingly true that even where an atmosphere contains carbon bisulphide many works engineers and electricians install switchgear of the most flimsy design and altogether fail to appreciate the potential dangers to which they consequently expose the workpeople.

The design of apparatus for such atmospheres calls for special consideration, both from the design and manufacturing points of view. This fact, generally speaking, naturally tends to increase the price, and as no definite regulations exist for this class of apparatus the manufacturer of the cheap and flimsy article often " gets away with it."

Many engineers have, I am glad to say, appreciated the fact that an article which costs even a little more is bound to be better. Reliable switchgear that can be safely operated in all kinds of atmospheres and will withstand the roughest usage is not cheap and works engineers owe it to their directors and fellow workers alike to recommend the purchase of only the best because the best is safest. JOHN A. ENGLAND.

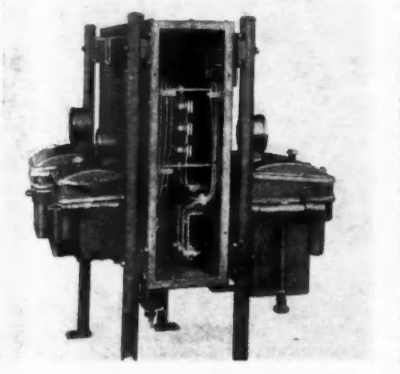
Salford, *May 15th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Small Draw-out Breakers

In their new range of industrial switchgear MESSRS. GEORGE ELLISON, LTD., Perry Barr, Birmingham, have applied the principle of draw-out double isolation to circuit-breakers of from 20 to 300 A capacity, at up to 660 V, the design of which has been governed by such considerations as safety during inspection and maintenance, saving of floor space, easy mounting, and accessibility of cabling.



Ellison draw-out industrial switches mounted on a bus-bar chamber

Any suitable flat surface with provision at the back for cables or bus-bars can be used for mounting the breakers, it being necessary only to cut a hole in the surface to receive the terminals projecting from the chassis, which is bolted to the structure. The chassis carries plug sockets, connection terminals and a pair of slide rails, and the other main component, the breaker proper, slides on the chassis rails and is fitted with plugs.

Adequate interlocks are provided, and a hinged cover on the chassis may be padlocked over the plug sockets when the breaker unit is removed. Convenience for cabling and connections, accessibility and the handles and space for instruments, &c., are the only considerations which control any type of unit assembly—tier or column, single, back to back, &c.

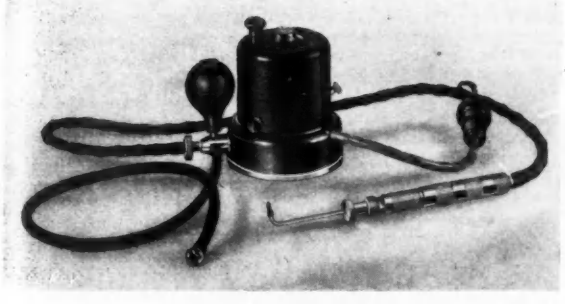
A New Flexible Cord

The "Saxovac" flexible cord, which has recently been introduced by the SAXONIA ELECTRICAL WIRE CO., LTD., Roan Works, Greenwich, S.E.10, contains inside each copper conductor (23/36) tinned steel wires to give mechanical strength. The insulation consists of two layers of vulcanised india-rubber, with a tough-rubber sheath overall. The whole is then braided in black. The price is 36s. per 100 yds.; three-core flex costs 48s.

Cleaning Teeth by Electricity

A novel appliance has been introduced by the HYDRO PULSATOR, 77, Grosvenor Street, W.1, for cleaning the teeth by means of water projected against the teeth at high pressure and pulsating at a high frequency. The instrument is electrically operated and through the medium of a flexible tube control handle and nozzle projects at high pressure a fine jet of water or medicated liquid to which are applied 3,500 pulsations per minute. The pressure and degree of pulsation can be varied by means of the control handle.

The principle on which it operates is a combination of the action of a high-pressure jet of water, with the addition of a high-frequency pulsation transmitted to the body through the jet of liquid itself. It is this pulsation which produces



The "Hydro-pulsator"

a concentrated massaging and it is claimed that the apparatus will remove particles of food from the teeth which an ordinary toothbrush fails to dislodge.

An "Anti-smash-and-grab" Device

In an endeavour to frustrate shop-window "smash-and-grab" raiders the GENERAL ELECTRIC CO., LTD., has devised apparatus, which was demonstrated at Magnet House recently, by means of which the breaking of the window glass causes trip mechanism to lower the goods displayed into a well in the window bottom, while simultaneously and automatically a steel spring roller shutter flies forward and completely closes the window bottom.

The "Anti-smash-and-grab" device in action

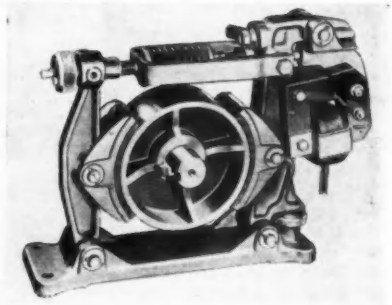
The equipment, which is remarkably quick in action, consists of two banks of mirrors, one at either side of the window, each bank being concealed behind the shop fittings. A source of light is fitted at the bottom corner, and the rays, after passing through a filter which cuts out the visible light, are reflected from side to side in an invisible zig-zag band of light, which finally passes from the last mirror into the eye of an "Osram" photo-electric cell which is also carefully concealed.

The immediate result of the slightest interruption of this "curtain" of light is to cause a disturbance of the energised electrons inside the photo-cell, which, in turn, instantly closes an electrical relay, and in this way sets the mechanism in motion.

Electric Cranes and Hoists

A new design of brake for use with electrically driven cranes, mills, hoists, &c., has recently been put on the market by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester. In determining the size of brake it has been usual in the past to consider only the braking torque and horse-power rating of the brake, but for heavy service the energy of the moving parts which has to be absorbed by the brake in bringing them to rest must be taken into account in order to prevent overheating and the rapid wearing away of the linings which is consequent upon this.

The new brake is released against the force of the compression spring which normally holds it on by a clapper solenoid. A hand release is also provided which locks the brake in the "off" position. The standard drum widths are 4, 6, 8, 10 and 12 in., and so that a brake suitable for any particular duty may be selected a table is published showing the permissible energy dissipation of each size per hour in foot-pounds when stationary, and in foot-pounds per r.p.m. when rotating. The simplicity of the design can be seen from the illustration; at the same time, the brakes are easy to adjust or dismantle. The compression spring is set to the correct length when erecting, and requires no further attention.



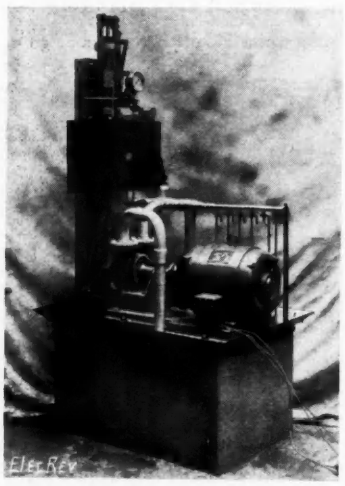
The "Perigrip" brake

A milled nut is provided for adjusting the clapper air-gap to compensate for wear on the brake linings. Another milled nut acts as a stop and is adjusted so that the brake lining is clear of the drum when the brake is in the off position. A test made on an 8-in. brake showed that each shoe could be removed in less than thirty seconds. Spare shoes already lined can be fitted in a few minutes when the linings of the brakes become worn. The old shoes can then be relined and kept in readiness for use.

An Automatically Variable Fuel-oil Pump

A fuel-oil pump for boiler firing, the output of which is variable automatically by adjustment of the stroke is supplied by the ROTOPLUNGE PUMP CO., LTD., 58, Victoria Street, West-

minster, S.W.1 It is the company's standard type with reciprocating plunger, rotary motion, but it has no valves. Control is exercised automatically by means of a Hagan regulator valve which is operated through metal bellows and levers by small changes of pressure at the pump delivery. This valve controls the movement of the power piston, which is connected to the pump by levers which, in turn, vary the stroke of the pump plungers.



The new "Rotoplunge" pump

Compensating devices prevent hunting and the pressure remains constant while admission is varied. The power absorbed by the driving motor is reduced according to duty, costly and heavy gear is not required, neither are relief nor hand controlled valves for bypassing, the avoidance of which prevents depreciation of the oil by uselessly circulating and churning it.

The "Nife" Miner's Lamp

The new "Nife" miner's lamp is designed on the "two-piece" principle—that is to say, there is a top in one unit and battery and bottom half of the lamp are combined in another unit. The main body of the lamp top is an accurately machined steel drop forging. It is provided with a heavy square thread for attachment to the bottom part of the lamp and a smaller thread to take the screwed ring which holds the contact and bulb assembly in position. The pillars carrying the crown and hook are screwed into the steel forging. It is possible for the pillars to be completely smashed without the main top of the lamp suffering in any way. The hook is of the usual round shape, but specially designed so that it cannot come into contact with and so damage the well glass.

The whole assembly, as one unit, is held into the drop forged top by a screwed ring so that dismantling is very simple; a bulb can be changed in less than half a minute. The basis of the contact assembly is a solid ebonite moulding, the feature of the design being that it is quite impossible for any corrosive effects from the electrolyte to get through to the bulb as the bulb chamber is hermetically sealed from the rest of the lamp. On the underside of the ebonite moulding the contact disc floats on two flat springs of strong design which ensure even pressure on the terminals.

The base of the bulb is surrounded by a white enamelled conical reflector inside the prismatic well glass and another reflector is fixed to the underside of the lamp crown, thus throwing the light downwards and practically eliminating ground shadows. A further reflector is fitted to the flat part

The "Nife" miner's lamp

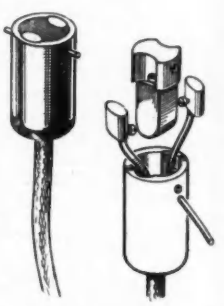
of the lamp top outside the base of the well glass and this throws more illumination up to the roof.

A "Nife" nickel-cadmium alkaline accumulator is used, and a special charging rack is available.

A Novel Lamp-socket Adaptor

The chief merits of the lamp-socket adaptor manufactured by MR. GEO. TURNOCK, Trunion Works, 41, High Street, Aston, Birmingham, 6, are its robustness and avoidance of internal short-circuit risk. The accompanying sketch shows the plain cylindrical bakelite holder to be entirely devoid of screw threads, reducing liability to break.

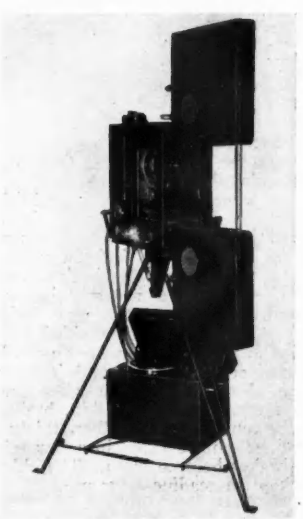
It is suitably shaped internally to accommodate two oval brass terminals of generous proportions, the heads of whose wire-fixing screws fit snugly into two holes in the bakelite separator. The latter is so slotted and shaped as to isolate effectively both terminal blocks, thus guarding against short-circuits. The core slips into the cylindrical case and is held firmly in place by a push-through pin, which also serves to hold the adaptor in a bayonet-type lamp socket. This adaptor is 1.5 in. long and $\frac{13}{16}$ in. in diameter.



The construction of the "Trunion" lamp-socket adaptor

Portable Sound Film Apparatus

THE foremost feature of Philips's "Cine Sonor" portable projector is that it complies with the fire regulations. The film, in going through the sound gate, passes through a metal snaffling arrangement to the spool box. In passing through it holds a lever in such a position that should the film break the lever becomes free and actuates a control which closes the snaffle. This ensures that, should the film catch fire in the film gate, it will instantly be extinguished by these metal clips, and the burning film cannot penetrate to the spool box and set the film there on fire. The spool box doors can only be opened when the door giving access to the sound gate and film transmission gear is open, while should the door leading to the transmission sprockets be opened the light will be switched off automatically.



The "Cine Sonor" apparatus

The optical system with its automatic rigid prefocusing of the exciter lamp remains primarily the same as in the standard "Sonor" apparatus, but the projector lamp is of novel construction. It is made suitable for operation at standard a.c. voltages and has a twin filament which is prefocused in front of a mirror, incorporated inside the lamp, which produces an image of the actual filament in between and therefore gives a continuous surface of light. In this manner 40 per cent. more light is said to be obtained, the capacity being equal to a 15-A carbon arc. To compensate for mains fluctuations control is provided in four steps of 2 A.

A throw of 80 feet gives a projected image of 12 ft. by 9 in., which can be increased to 15 ft. by 12 in. Before the beam of light passes through the lenses it can be shut off by an emergency shutter, actuated by a knob on the outside of the apparatus so that it can be operated instantly. After the beam has passed through the lenses it has to travel through a water jacket, which eliminates 60 per cent. of the heat emanating from the projector lamp. Next comes the ordinary shutter, which acts also as a fan for further ventilation, so that the light gate remains cold. Standard 35 mm. width film is used and the reaction motor and speed regulator enable the film to be run off at any desired speed, while the above-mentioned water cuvette and ventilating fan ensure that a highly inflammable film can be left stationary for eight seconds without there being any danger of its catching fire. All the automatic locking devices are in series, so that if the door leading to the projector is left open the light cannot be switched on. The apparatus is automatically lubricated and it is started and stopped by press buttons connected in series.

Either a 50-W or 25-W amplifier can be supplied and volume can be adjusted to five positions. The entire equipment can be assembled in six cases and the loud-speaker is built into the side of one of the cases. The total weight is 550 lb.

How to Sell Domestic Service. By H. Smith

Some points to be avoided

WITH the advent of a cheaper supply of electricity and the speeding up of the erection of small houses the opportunities of the electricity salesman could not be better. The problem of selling electricity to the average householder is mainly psychological, although the expense of changing to an all-electric house is fairly considerable.

Domestic "all-in" rates are one of the greatest drawbacks to the sale of electricity, as large numbers of householders do not understand them and cannot agree to pay a standing charge before using any electricity. The householder's main complaint is that if he had lighting alone, on the ordinary lighting rate, it would not cost him more than his standing charge, losing sight of the gain he would make if any power were used. It appears necessary that this point should be cleared up with the prospective consumer at the beginning, and, if possible, the salesman should obtain from the householder his average yearly costs for heating, lighting, cooking and water heating.

I have found by making inquiries of a large number of consumers living in the usual type of six- or seven-roomed suburban villa that their average total yearly bill amounts to about £15 for all of the above services when using coal for heating, gas for cooking, electricity for lighting, and either coke or gas for water heating. The problem is, therefore, whether the salesman can convince the householder that an all-electric or even a partially electric house would be cheaper to run. In considering his arguments to put before the householder the salesman should be careful to make no reference to labour saving, unless, of course, the prospective consumer owns a mansion and employs a number of servants. The average householder of the type that employs a general maid or none at all wants to save money and not labour.

In the case of the "one-maid" house the prospective consumer does not want to be told that he can dispense with his maid if he uses certain electrical appliances, for it means that the whole of the housework will fall upon his wife, who is certain to object. Further, there is the question of the "prestige" which a maid servant gives to a suburban villa. In the case of the servantless house, labour-saving is very seldom considered if it involves any additional expense; it will uusally be found that the housewife is quite content to expend a little more labour if any saving in money can be made. The salesman should therefore tread warily when on this subject.

Where he may score is on the question of saving on interior decoration, as so many consumers now own the house they live in; the point to make here is that summer cleanliness and freshness can be maintained throughout the winter in an all-electric house as there are no fumes and soot to cause deterioration of furnishing fabrics or to blacken walls and ceilings. The saving in this direction can be considerable, as redecoration should not be necessary under at least twice the period required if coal fires and gas are used.

Initial and Running Costs

The cost of fitting out a house with electrical appliances is a frightening figure to the average householder, but he may be tempted by the hire-purchase system, payments being made either quarterly or proportionately through a prepayment meter.

Electricity should be sold at ½d. per kWh to compare favourably with other services. With a domestic tariff of, say, £3 per annum plus ¾d. per kWh, it would be difficult to run an all-electric house of the six-roomed type under £24 a year.

After experimenting with a practically all-electric house, I decided in 1931 to use coal for partial heating in an endeavour to reduce the yearly bill, but was unsuccessful for various reasons, chief among them being the fact that it was a very cold spring and electric heating was resorted to in the evenings. In 1929 and 1930 using electricity for all purposes except water heating, which was carried out by gas, the yearly bills were in each case over £24, but in 1931 when coal was used for part heating the cost rose to over £27; in 1932, however, under the same arrangement the cost was reduced to £22.

A further attempt to reduce the costs was made in 1933; in this case electricity was used only for lighting, wireless, iron, cleaner and only very occasional heating on chilly nights in the spring and autumn. The result in this case was an expenditure of £19 10s., which showed a saving worth considering when electricity was ¾d. per kWh and the standing charge £3 per annum. It follows, therefore, that if the salesman is attempting to sell electricity at a figure above ¾d. per kWh he will have some difficulty in convincing the prospective consumer that electricity is the best and cheapest domestic service.

Service and Attention

Another point to consider is the question of service. Every opportunity should be taken to interview a prospective client without deliberate canvassing, for nothing is more annoying to the average householder than this. At the present time there are quite enough door-to-door salesmen, and the man from the supply company is likely to be turned away with the rest.

The attitude to-day of some supply companies seems to be, "We have electricity to sell; if you want any come and buy it." Gas companies, on the other hand, lose no opportunity to let prospective consumers know all about their latest appliances; they send well-illustrated brochures complete with prices and running costs.

I know of a man who changed his residence from one district to another; he wrote and asked the gas company to connect up the meter and cooker and the electricity supply company to connect up the lighting meter. The gas company replied that everything would be done at the required time, sent a brochure of all its appliances in a very neat wallet, and stated that it would be pleased to send a representative in case the consumer required anything further.

On the other hand, the electricity supply company wrote asking for a deposit of 30s., which would be returned if the references were found satisfactory, and further stated that the matter of connecting up would be considered. As the house had been occupied before, the supply company knew there were no power points, but it made no effort to press any sales and missed a good opportunity.

This, I consider, was a case when a representative could have called with all the information possible, especially as the rate was less than ¾d. per kWh. This householder is considering using gas for water heating and in any case one gas fire is installed. There is no doubt that every opportunity should be grasped if any real headway is to be made in the sale of domestic supply.

New Books

Physical Constants. By W. H. J. CHILDS. Pp. 77; figs. 7. London: Methuen & Co., Ltd. Price 2s. 6d.

This book is an excellent example of the condensation of a large amount of useful data into a small compass. All the important physical constants most frequently required are to be found in its pages, and everything is done to enable them to be easily picked out. It is certainly a contrast to many engineering "pocket" books which would require the pockets of a poacher or a conjurer; the author has been rigidly selective, and the result is something really small and light which yet contains the essential data worked out to the proper number of significant figures from the most recent determinations. The book is well arranged and is set out in clear type.

There are seven nomograms which form a useful novelty in a book of this kind. These range from barometer and thermometer corrections to the rapid calculation of wire resistances. In addition to the constants one expects to find, there are tables of dielectric constants, X-ray data, the most recent isotope values, and atomic constants. The book is completed by the inclusion of four-figure logarithms and antilogarithms, sines, cosines and tangents, squares and reciprocals, set out in a style of printing which we have not met before and which enables a rapid use of the tables to be made. It is a book which certainly can be recommended.

First Year Engineering Science (Mechanical and Electrical). By G. W. BIRD. Pp. 164; figs. 117. London: Sir Isaac Pitman & Co., Ltd. Price 5s.

This book has 122 pages of text and six pages of "useful formulæ," log. and trigonometrical tables. Nearly 20 per cent. of the text is occupied by questions to be worked, and the answer to each numerical question is printed after it. Thus the author endeavours to get an elementary treatment of the fundamentals of mechanics, electricity and magnetism, and some steam engineering, with two pages of steam tables and 117 illustrations into some 100 pages.

The first part of the book is devoted to elementary mechanics, in tabloid form, as may be judged by the ten lines or so of text given to pin-jointed frames. We also find that friction just happens; surely some of the accumulated research on this subject should by now have found its way into an elementary

book. The treatment of vectors suffers in the same way, and we notice that in one or two of the diagrams some correction is necessary to the sense of the vectors. Turning to the electrical section, we find a conventional and antiquated method of approach through permanent magnets, and in the first half-dozen lines the statement occurs that "nickel, cobalt, magnesium, copper, and bismuth are very slightly magnetic." How is any teacher to escape from a tangle due to the inclusion of the last three of these metals?

Chapter VII deals with the magnetic effect of a current, although the nature and production of a current has not been dealt with, but we are immediately confronted with a formula for the field of a concentrated coil without any explanation as to how it is arrived at. The formula for the field of a solenoid is also unexplained. In the chapter on instruments the tangent galvanometer is first dealt with, and we are told "other types of galvanometers may be classified as (1) moving coil, (2) vibration, (3) string galvanometers." Why mention the last two types in an elementary book? Throughout the section we find the same inadequate treatment; the author hastens to present a formula and work a numerical example. On the whole we feel that the book has failed, because it has tried to get too much into a small space and because the subjects have been sacrificed to the examination system.

The Poplar Coal Contracts

MR. CLEMENT GIBSON, the District Auditor, who was responsible for holding the special audit into the matter of the Poplar Council Electricity Department coal supplies, gave evidence at the Westminster Police Court on May 11th, when William McElroy, coal contractor, appeared on remand to answer two summonses alleging that he had obtained sums of £1,157 and £1,373 by false pretences from the Poplar Borough Council. Owing to the illness of Mr. Hay Halkett, the magistrate who presided over the first hearing, the case was heard by Mr. Ronald Powell, who had the evidence of the first witnesses read over to him.

Mr. Gerald Dodson, for the prosecution, said that the alleged false pretence was that the coal supplied to the Council was Durham peas, whereas it was Northumberland smalls or nutty slack, which was a cheaper type of coal.

Mr. Clement Gibson then gave evidence regarding his inquiry, and Mr. Dodson read extracts from a shorthand note taken during an interview with the defendant. In the course of this the defendant said that "Philton peas" was a trade name used by his firm exclusively. It described coal which came from various parts of the north, including Northumberland. He invented the name "Philton peas" for Poplar; other names were used for other places.

Mr. Dodson said that when McElroy was asked if Durham coals were dearer than Northumberland coals he said that some were, but some Northumberland coal was just the same. Sometimes some Northumberland peas were dearer. It depended upon the demand. He agreed, however, that generally speaking Durham coals were dearer. After Mr. Dodson had read further extracts the case was adjourned.

When the hearing was resumed on Monday last evidence was given of the registration of the firm of McElroy, signed by William McElroy and dated October 17th, 1922. Notice of the cessation of business was recorded by William McElroy on April 10th, 1934, on the firm becoming a limited company.

Mr. Joseph William Kime, assistant district auditor, said that in connection with the extraordinary audit of the Poplar Borough Council's affairs he examined the books and records of McElroy and Co. He saw no books or documents having regard to the purchase of Durham coal, nor evidence of the defendant having supplied such coal to the Poplar Council, nor of his having supplied coal of a grade known as peas.

Mr. Charles H. Coppinger, station superintendent of the Poplar Electricity Department, said that in general terms he would describe the coal supplied by defendant as good rough slack. Peas were a graded coal, whereas rough slack generally speaking was not. He did not think that a good nutty slack could be better than peas. As superintendent he was responsible for the burning of the coal. There had been no exceptional repairs due to the fuel.

Mr. H. Cooper, managing director of Messrs. William Cory and Co., coal merchants, said that peas were coal which would go through a screen from half to three-quarters of an inch in diameter, whereas Northumberland rough smalls would pass through a hole from one inch to an inch and a quarter in size. The price of Durham peas during the years in question would be 15s. 6d. per ton. The prices for Northumberland rough smalls varied but would be 9s. 6d., 10s., or 10s. 6d. free on board at port of loading. Transport expenses, discharging and barging fees would account for a further 6s. 9½d. per ton. Northumberland rough smalls would produce 10,800 B.th.u.; nuts would produce from 12,000 to 12,200, and Durham peas would give from 13,750 to 14,000. He could not recall any power station similar to Poplar burning Durham coal, except in Durham where they all used it, although many used the Northumberland variety. The seam which produced peas in Durham extended northwards into Northumberland, changing its characteristics as it went.

This concluded the case for the prosecution. The magistrate asked defendant if he wished to say anything. Mr. Eastwood, replying on his behalf, said that he answered "Not guilty" and reserved his defence.

The magistrate committed him for trial at the Central Criminal Court. He was allowed bail in his own surety of £500.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON May 9th Mr. G. Peto asked the Minister of Transport whether the conditions for the supply of electricity and any alterations thereto issued to consumers by electricity undertakers received examination and sanction by the Electricity Commissioners or any other authority.

Mr. Stanley said that certain conditions of supply were laid down by the Acts or Orders of the undertakers and by the statutory regulations applicable to the undertaking, but there were necessarily a number of conditions made in the ordinary course of business by commercial undertakings such as electricity undertakings which were not required to be submitted for approval before being made.

Mr. Peto asked whether, as these were monopoly concerns, some authority ought not to exercise a check on the conditions under which they supplied the consumer.

Mr. Stanley said that Parliament had laid down certain conditions under which this monopoly might operate, and no conditions which they attached that were contrary to the statutory conditions would be allowed to exist.

Mr. G. Peto then asked the Minister what steps were taken to enable the consumer to know the conditions on which electricity undertakers had obtained their Act or Order and any subsequent regulations made by the Electricity Commissioners.

Mr. Stanley said that where an application was made for statutory powers to supply electricity, a definite procedure had to be followed involving the giving of public notices. The Act or Order when granted and any statutory regulations applicable to the undertaking became public documents which were accessible to any interested parties. Undertakers were also required to keep copies of the regulations at their principal office within their area of supply and to provide a copy thereof to any person demanding it on payment of the price of the published regulations.

Mr. Peto further asked whether the Electricity Commissioners or any other competent authority took steps to see that electricity undertakers observed the terms of their Act or Order and any subsequent regulations issued by the Commissioners.

Mr. Stanley said that in common with other bodies exercising statutory powers, electricity undertakers were under statutory obligation to observe the terms of their Act or Order and appropriate regulations, which were public documents and accessible to any interested parties. If the attention of the Electricity Commissioners was drawn to any case of alleged non-compliance they would, of course, take steps to investigate the matter.

Rural Electricity Schemes

On May 9th Lieut.-Col. Heneage asked the Minister of Transport how many special electricity schemes for rural areas were in operation; and whether he proposed to institute further schemes.

Mr. Stanley said that a number of schemes for the provision of electricity supply in large tracts of rural territory had been submitted to and approved by the Electricity Commissioners during the last four or five years and had been or were being carried out. Two special schemes in the Bedford and Norwich areas respectively included proposals for comprehensive and accelerated development to be carried out within a limited period. He was not aware that there were at present any other similar cases in preparation. The Electricity Commissioners continued to watch over rural development, and schemes for extending rural supply as they came before them would receive their careful attention.

Electric Signs

On May 10th Mr. Hicks asked the Minister of Labour whether, arising out of the statement that there was a lack of men qualified to erect neon electric signs, he had received a communication from the Electrical Trades Union pointing out that a large number of such men were unemployed, and that this type of labour recruited from training centres had been chosen on account of its cheapness; whether he had made further inquiries into the facts; and whether it was the settled policy to provide cheap labour through the medium of training centres.

Mr. R. S. Hudson, who replied, said he had received such a communication. He was inquiring into the representation made by the Union and would communicate with it and the hon. member in due course. He might say, however, that he should have referred to the manufacture, not the installation, of neon electric signs. With regard to the last part of the question, the purpose of the centres was to give unemployed young men from the depressed industrial areas a course of training in skilled trades which should enable them not to compete with fully skilled men but to earn a wage sufficient to maintain them while they added to their skill and experience, and consequently to their earning power.

The Television Committee

On May 14th Sir K. Wood, Postmaster-General, in reply to Capt. Cunningham Reid, said that the terms of reference of the Television Committee were as follows:—"To consider the development of television and to advise the Postmaster-General on the relative merits of the several systems and on the conditions under which any public service of television should be provided."

The Committee would be constituted as follows.—Chairman, Lord Selsdon; vice-chairman, Sir John Cadman; members, Col. A. S. Angwin, assistant engineer-in-chief, G.P.O., Mr. Noel Ashbridge, chief engineer, B.B.C., Mr. O. F. Brown, Department of Scientific and Industrial Research, Vice-Admiral Sir Charles Carpendale, Controller B.B.C., Mr. F. W. Phillips, assistant secretary, G.P.O.; secretary, Mr. J. V. Roberts, G.P.O.

The Electricity (Supply) Bill

On May 14th the Electricity (Supply) Bill (the Central Board Bill) was considered by the House of Lords on report. A number of Government amendments were made. On Clause 1 (Arrangements between the Central Board and authorised undertakers), Lord Plymouth, for the Government, moved an amendment to provide that the Board should have power to make arrangements with authorised undertakers who controlled a generating station which was not a selected station as well as those who were the owners of a generating station. The amendment was agreed to, as was a further amendment to provide that after the passing of the Act the Central Board should not enter into any arrangements except with the consent of the Electricity Commissioners, who should not give their consent unless they were satisfied that the arrangements would not result in a financial loss to the Board, and, after giving authorised undertakers who were under contract to supply electricity to or take a supply of electricity from the owners of the generating station in question an opportunity to make representations with respect to the matter, they were satisfied that the arrangements would not result in any substantial prejudice to any such authorised undertaker.

Lord Plymouth moved a third amendment to provide that the Central Board should not enter into any agreement for the supply of electricity to authorised undertakers at prices or on conditions other than those specified in the appropriate tariff, unless and until the Board had satisfied the Electricity Commissioners that the agreement would not result in a financial loss to the Board. This was agreed to.

On Clause 3 (Amendment of Section 12 of the 1926 Act) Lord Plymouth moved the insertion of the following new subclause, which was agreed to: "The price to be charged under Section 12 of the Electricity (Supply) Act, 1926, by authorised undertakers for electricity supplied to a railway company for haulage or traction purposes shall include: (a) An amount equal to such proportion of the contributions payable by the undertakers in respect of the expenses of the Electricity Commissioners as is properly attributable to the supply of that electricity to the railway company; and (b) such charges and allowances in respect of any transmission line or part thereof used by the undertakers for the purpose of that supply as would be included if the supply were a supply in bulk to authorised undertakers."

The report stage was concluded.

British Overseas Electrical Trade

ALTHOUGH our April exports of electrical equipment and machinery were lower in value than in March (due no doubt to the incidence of Easter), the Board of Trade returns show that the total was well above that of April, 1933. It will be seen from our tables that this improvement was shared by all but six of the twenty-two classes specified, the outstanding increase occurring in the case of non-submarine telegraph and telephone cables. The tendency of the machinery exports to decrease was further evidenced, for although shipments of generators were greater there was a more than counterbalancing fall in exports of motors and controlling equipment.

The trade with Australia showed a further welcome improvement, and British India also took a larger share. The principal item credited to foreign countries was the shipment of goods worth £30,126 to Egypt.

Included in the items shown in the larger table were the following, the April, 1933, figure being given in parentheses.

Rubber insulated wires and cables: South Africa £11,009 (£12,081); British India, £9,267 (£12,742); Australia, £12,026 (£8,093); New Zealand, £2,672 (£1,230); other British countries, £9,772 (£7,349); foreign countries, £8,488 (£5,503).

Electric wires and cables (insulation other than rubber): South Africa, £8,109 (£17,001); India, £23,035 (£7,800); Australia, £8,630 (£8,554); other British countries, £8,373 (£5,818); foreign countries, £9,430 (£8,469).

Telegraph and telephone apparatus (not radio): South Africa, £14,377 (£11,502); Australia, £6,059 (£2,348); Canada, £436 (£775); other British countries, £16,273 (£7,894); Argentina, £5,520 (£3,935); other foreign countries, £22,512 (£22,984).

The imports were also higher than in April, 1933, mainly on account of large purchases of radio apparatus and incandescent lamps; there was a notable decline in the imports of vacuum cleaners (apparently Canadian). The sources of imports of electrical goods and apparatus were as follows:—

From British countries, £11,574 (£8,091); Germany, £48,337 (£53,002); Netherlands, £39,345 (£18,831); Belgium, £9,211 (£4,518); France, £11,768 (£9,113); Switzerland, £11,913 (£8,363); Austria, £7,844 (£4,444); United States, £56,432 (£23,432); other foreign countries, £36,443 (£13,118).

Vacuum cleaners came from the following: Canada, £2,431 (£16,034); other British countries, £22 (£61); Sweden, £5,062 (£2,905); Germany, £2,041 (£1,330); United States, £7,430 (£7,034); other foreign countries, £2,739 (£894).

EXPORTS AND IMPORTS DURING APRIL

	Exports. April, 1934.	Exports. Inc. or dec. compared with April, 1933.	Imports. April, 1934.	Imports. Inc. or dec. compared with April, 1933.
Submarine telegraph and telephone wires and cables	£1,232	+ £1,145	*	—
Telegraph and telephone wires and cables (not submarine)	48,352	+ 34,039	*	—
Other insulated wires and cables	110,811	+ 16,171	£16,383	+ £3,268
Radio receivers (excluding valves)	19,718	+ 6,560	28,346	+ 23,548
Radio transmitters (excluding valves)	21,906	+ 13,379	*	—
Radio valves	24,232	+ 1,140	13,246	+ 7,577
Other radio parts and accessories	43,927	+ 18,943	41,359	+ 24,195
Telegraph and telephone apparatus (other than radio)	65,177	+ 15,739	*	—
Electric carbons	*	—	13,678	+ 461
Incandescent lamps	35,585	+ 5,174	29,514	+ 15,712
Other lighting apparatus	27,242	+ 6,059	22,238	+ 234
Primary batteries	16,061	+ 1,411	294	+ 46
Accumulators	26,296	− 9,369	*	—
House service meters	11,474	− 847	18,402	− 1,299
Other elec. instruments	16,506	+ 5,818		
Unenumerated elec. goods and apparatus	100,025	+ 14,584	49,407	+ 16,213
Elec. generators up to 200 kW	17,254	+ 6,335	*	—
Elec. generators over 200 kW	39,053	+ 22,882	*	—
Electric motors	65,750	− 24,661	14,109†	+ 1,799
Convertors and transformers	38,822	+ 22,832	*	—
Starting and controlling gear for elec. motors	19,888	− 32,239	*	—
Switch gear	54,643	− 128	*	—
Other elec. machinery	9,520	− 556	8,989	− 1,949
Elec. vacuum cleaners	*	—	14,570	− 13,603
Total	£813,374	+£124,411	£258,396	+£76,202

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING APRIL

Destination.	Goods and apparatus, April, 1934.	Inc. or dec. compared with April, 1933.	Elec. generators, April, 1934.	Inc. or dec. compared with April, 1933	Motors, April, 1934.	Inc. or dec. compared with April, 1933.	Other elec. machinery, April, 1934.	Inc. or dec. compared with April, 1933.
Irish Free State	£17,878	+ £324	*	—	*	—	*	—
Union of South Africa	83,871	+ 3,187	£2,036	− £896	£8,146	+ £1,019	£50,573	+£29,336
British India	84,586	+ 19,033	36,445	+ 32,632	7,923	− 1,663	21,180	+ 109
British Malaya	9,311	+ 2,544	*	—	*	—	2,028	+ 1,207
Ceylon	5,080	+ 2,509	*	—	*	—	*	—
Hong Kong	5,938	− 796	*	—	*	—	*	—
Australia	55,946	+ 20,283	1,239	− 221	4,214	+ 839	5,655	+ 3,371
New Zealand	26,262	+ 2,972	*	—	1,782	− 930	5,068	− 23,820
Canada	5,468	+ 2,072	200	+ 74	2,181	+ 375	685	+ 237
Other British Countries	49,582	+ 17,573	8,596	+ 5,584	8,105	+ 2,980	10,666	+ 3,797
Sweden	8,514	+ 3,843	*	—	*	—	*	—
Denmark	10,398	− 4,089	*	—	*	—	*	—
Belgium	9,641	+ 2,866	*	—	*	—	*	—
France	10,095	− 4,007	*	—	*	—	2,000	+ 267
Spain	7,545	+ 2,534	*	—	*	—	*	—
Italy	4,754	− 3,928	*	—	*	—	*	—
Greece	2,246	− 6,857	*	—	*	—	*	—
Egypt	30,126	+ 18,587	*	—	*	—	1,127	− 6,658
China	9,912	+ 1,409	*	—	*	—	7,276	− 1,061
United States	2,064	− 209	*	—	*	—	*	—
Argentina	15,621	− 1,738	*	—	*	—	552	− 1,922
Other Foreign Countries	113,706	+ 51,834	7,791	− 7,956	33,399	− 27,281	15,963	− 14,954
Total	£568,544	+£129,946	£56,307	+£29,217	£65,750	−£24,661	£122,773	−£10,091

* Not classified separately.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Activities in Lancashire

A sixty-mile tour by the travelling electricity showroom of the Lancashire Electric Power Co. has recently been conducted within a seven mile radius of Chorley with a view to developing the load in these outlying districts and obtaining new consumers. The stay at each place was normally between ten days and a fortnight. The average attendance at each place was about 300 people, and twenty-two cooking demonstration sessions were held, the average attendance at each being thirty-one.

On April 30th electricity was made available in the urban district of Aspull, situated within a few miles of Wigan, and already orders have been received for cookers, grillers and kettles.

New showrooms are to be established by the company in Chorley; these will occupy a prominent position in Market Street, the principal thoroughfare. The new premises, which will replace the showrooms already in existence in the town, will provide more adequate facilities for demonstrations, and are to include ample accommodation for stores and offices.

Engineers and the 40-hour Week

The Engineering Employers' Federation, at a conference held in London on May 10th, decided to reject the demand of the unions in the industry for a forty-hour week, without reduction of pay. It was contended that mechanisation and hours of labour were not the causes of unemployment, which was due to bad trade. A more effective method of securing the sale of goods was to keep costs of production down within the limits of world purchasing power, and the effect of the forty-hour week would be to increase costs. A joint meeting of the unions concerned will be held next month to consider further action.

An Assurance Company's New Offices

The new offices in Pall Mall, S.W., of the Employers' Liability Assurance Corporation are very handsome, as the pictures on page 697 demonstrate. The frontage (by Messrs. Pollards) is "all-steel," and the offices were designed by Sir Courtauld Thomson, the new chairman of the Corporation, in collaboration with Lord Knollys, the managing director. Messrs. Troughton & Young were responsible for the electrical installation. The interior furnishing and decoration was carried out by Messrs. Lenygon & Morant, Burlington Street, W.1, and the neon sign on the facia was made by Claude-General Neon Lights, Ltd.

Henley Cable for China

A drum containing a 935-yd. length of 3-core 6,600-V, 125-sq. mm. wire armoured and served underwater cable has been shipped by W. T. Henley's Telegraph Works Co., Ltd., to China for the Pootung Electric Supply Co., Ltd. The cable has pre-spiralled shaped conductors, is paper insulated

Henley submarine cable being shipped to China

and lead covered, the lead sheathing being protected against corrosion by two coats of compounded paper, is bedded with compounded jute, armoured with two layers of galvanised-steel wires and served overall with two coats of compounded jute. Each core is provided with a seamless lead sheath applied with the Henley patent straight-through lead press.

State Trading in Victoria

Under an Act passed during last session by the Victoria Parliament the State Electricity Commission has now to restrict its trade in electrical appliances. Recently the Commission has been selling off its stocks in Melbourne, Geelong, Geelong West, and Warrnambool. These salerooms will now be closed. The Commission may trade anywhere in Victoria except in cities, and Mr. F. W. Clements, the chairman, states that electrical goods may still be displayed, but on a smaller scale, as there will be no direct return.

A Topical Window Display

The accompanying picture of a recent window display at the showrooms of the Wolverhampton Corporation Electricity Department illustrates how advantage was taken during the showing of a well-known film at a local cinema to draw attention to electric cooking. One of the Department's cookers

A topical window display at Wolverhampton

was also on show in the vestibule of the cinema and Mr. T. A. G. Margary, the borough electrical engineer and manager, informs us that both of these displays proved very popular.

Registered Electrical Contractors

Applications for registration by the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Keeley, A. A., & Co., Harpurhey, Manchester.
Burns, J., New Cross, Manchester.
Booth, H. G., & Co., Levenshulme, Manchester.
Booth, F. J., Buxton.
Payne Bros., Catford, S.E.6.
Turner, C. F., Shirley, Croydon.
Letford, J. S., Surbiton.
Swainson, B. W., Chorlton-cum-Hardy, Manchester.
Shepherd Bros., Pendleton, Salford.
Redcar Radio Relays, Ltd., Redcar.
King, R. L., Sunningdale.
Coultard, H., Didsbury, Manchester.
Firth, J., Bradford, Manchester.
Shoolbred Electrical Co., Ltd., Luton.
Griffin Bros., Leighton Buzzard.
Chapman, J., & Sons, Manchester.
Gledstone, G., Manchester.

At the same meeting one application was withdrawn and four were declined.

Local Exhibitions

The Hazel Grove and Bramhall Urban District Council on May 7th commenced at the Mechanics' Institute an electrical exhibition which will continue until May 19th. A wide range of domestic electrical appliances is shown and demonstrations of electric cooking are given each day.

It was reported at the May meeting of the Colchester Town Council that arrangements had been made for a display of electrical apparatus by various undertakings in the Eastern Counties at the forthcoming Royal Agricultural Show to be held at Ipswich, and that Colchester would be responsible for cookers and cooking demonstrations.

The North Metropolitan Electric Power Supply Co., Ltd., was among the exhibitors at the Stevenage Trade Fair, opened by Sir Arnold Wilson, M.P. In addition to a comprehensive display of electrical appliances, the company gave cooking demonstrations.

Recent Contracts

The Brush Electrical Engineering Co., Ltd., has obtained an order for three sets, each of two large Diesel engines, to drive refrigerating plant on the three new vessels being built by Messrs. Harland & Wolff, Belfast, for the Blue Star Line. These ships will be named *Australia Star*, *New Zealand Star* and *Imperial Star*. They are vessels of 13,000 tons dead weight, and the first ship will be completed at the end of this year. The "Brush" engines will drive refrigerating plant, one set of which will be supplied by the Liverpool Refrigeration Co., the other two sets being furnished by Messrs. J. & E. Hall. The engines will be of the 4-cylinder hori-

zontally opposed piston, totally enclosed, fully forced lubricated pattern.

The Transport Committee of the Glasgow Corporation has placed a contract with the Hoffmann Manufacturing Co., Ltd., in connection with its tramcar reconditioning scheme. This covers the supply of 500 Hoffmann roller-bearing tram axle boxes.

Following on the contract recently received by the British Thomson-Houston Co., Ltd., for twenty-six electric control equipments and motor-driven compressors for the London Electric Railway, the company has received another order from the London Passenger Transport Board for 325 sets of relays, contactors, resistances, &c. These equipments are being supplied in order to convert the present control gear fitted to motor coaches equipped with straight field motors to make them suitable for the control of shunted field motors.

The Westinghouse Brake & Saxby Signal Co., Ltd., has secured the contract from the L.N.E.R. for the installation of train description apparatus between Fenchurch Street, Stepney East and Gas Factory Junction, two down roads and two up roads being involved between Fenchurch Street and Stepney East, and an up and down road between Stepney East and Gas Factory Junction. The apparatus to be installed is the company's latest form of ribbon storage apparatus. This apparatus is distinguished from other forms of describing apparatus in that the descriptions stored in the receiving cabin

Students at the Lighting Service Bureau

take the form of perforations in a continuous paper strip, with the result not only that a permanent record of the descriptions is obtained (together, if necessary, with the date and time that the description was received) but also economy in electrical apparatus is effected, together with simplification in the circuits employed.

Electric Lamp-making Filmed

Last week we attended by invitation of the Edison Swan Electric Co., Ltd., a private showing of the new Gaumont-British film "Watts-up." It shows the processes in the manufacture of electric lamps, but, although the actual "shots" were good, the film could be slowed down with advantage, as it was impossible at times to follow all that was going on. The accompanying film, "Industrial Britain," was excellent in every respect.

The films are in no way an advertisement, but are part of the "Gaumont-British Magazine." The episodes showing the manufacture of electric lamps were filmed in the "Edi-swan" factory, although no mention is made of this fact.

Irish Free State Electrical Imports

The imports of electrical machinery and cognate material into the Irish Free State during March last showed a slight decrease, having attained a value of £48,186 as compared with £60,703 in the corresponding month a year ago. The appended table shows the imports during the first three months of the current and past years; as will be seen there was a decline in the 1934 total, due, chiefly, to the reduced imports of radio material.

	January 1933.	March. 1934.
	£	£
Electrical machinery	34,354	48,942
Electric wires and cables	11,504	13,612
Electric lighting accessories, fittings and parts ...	12,462	10,493
Radio sets and parts	61,734	35,052
Other electrical goods	49,781	48,317
	£169,835	£156,416

Trade Commissioner's Visit

Mr. H. L. Setchell, H.M. Trade Commissioner at Melbourne, is on an official visit in this country and will be available at the Department of Overseas Trade from May 23rd-30th for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Australia. Later, he will visit a number of industrial centres in the provinces. Firms desiring interviews in London or information regarding Mr. Setchell's visit to the provinces should apply to the Department of Overseas Trade, 35, Old Queen Street, S.W., quoting reference 12024/1934.

Electrical Engineering in Belgium

In their report for the last financial year the directors of the Société des Ateliers de Constructions Electriques de Charleroi mention that having regard to the general trade depression the majority of the departments of the undertaking were kept fairly well employed. The cable works experienced a slowing down in the orders for telephone and armoured cables; the machine shops, however, turned out several large turbo-alternators, electric colliery winding engines, rolling mill motors, and electrically operated pumps.

The E.D.A. Carnival

As a result of the sixth electrical carnival held in Newcastle, under the auspices of the Northern Counties Area Committee of E.D.A., a sum of £104 has been paid to electrical charities, which we understand from Mr. A. Parkin, the Area Officer, is a record.

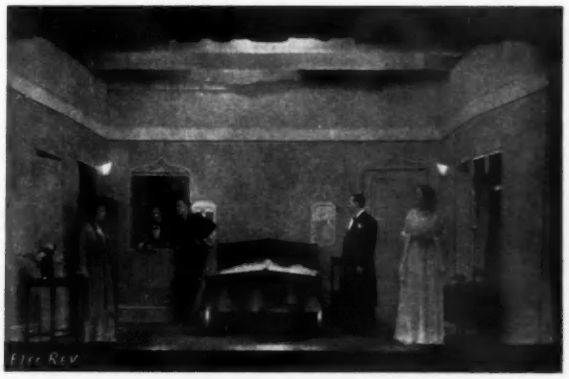
An Illumination Design Course

The twenty-ninth course on the Design and Selling of Electric Light, organised by the Lighting Service Bureau, was concluded on May 11th. Over 150 members of the electrical industry from all over the country were present and there were also representatives from abroad. During the five days of the course, which was arranged by Mr. W. J. Jones, manager of the Bureau, eighteen lectures were given, Mr. Jones delivering three. The speakers included Dr. A. B. Whitworth, Messrs. C. A. Hughes, H. A. Lingard, H. C. Wheat, R. P. Pelerin, R. O. Ackerley, T. Catten, E. B. Sawyer, R. C. W. Joyce, J. W. Howell, R. O. Sutherland, W. H. Williams, and Miss D. M. Noakes. On each evening visits were arranged to show those from the provinces some of London's best lighting, and on Thursday evening the visitors were the guests of E.L.M.A. at a dinner at the Howard Hotel. Mr. W. F. Moir, chairman of the E.L.M.A. Council, was in the chair, the principal guest being Sir William Ray. Mr. Moir said that since the inception of the Lighting Service Bureau in England, similar bureaux had been set up in nearly every part of the world. Sir William Ray replied to the toast of the guests and praised the Bureau for its perseverance in developing electric lighting not only in this country but all over the world. Among other speakers were Messrs. J. Y. Fletcher, J. Hayes and J. Fawcett. Mr. Jones announced that a new diploma was being presented by E.L.M.A. to those members of the electrical industry who attended the full course.

Social Events

The seventh annual sports meeting of Messrs. A. Reyrolle & Co., Ltd., will be held on June 9th at the recreation ground adjoining the company's New Town works at Hebburn. The prizes and championship cups will be presented by Sir Arthur N. L. Wood, chairman of the company.

The Ferranti Amateur Dramatic Society recently gave a performance of Edgar Wallace's play, "The Calendar." The performance attracted a greater attendance than at any pre-



A scene from "The Calendar" given by the Ferranti Amateur Dramatic Society

vious show, and was well received. The sound and musical accompaniments were dealt with by Ferranti amplifying equipments and speakers. A scene from the play is shown in the accompanying illustration.

The South Wales Company's New Premises

The new premises at Taff's Well, near Cardiff, of the South Wales Electric Power Co., comprising a spacious showroom and

a well-equipped demonstration kitchen, were officially opened on May 10th. Mr. C. T. Allan (assistant manager) presided at the opening ceremony, which was performed by Mrs. S. B. Haslam (chairman of the Cardiff and District branch of the Electrical Association for Women). At the conclusion of the ceremony Mr. H. W. Mabbett (district representative, Taff's Well) presented Mrs. Haslam with a waffle iron on behalf of the company. Among those present were Mr. R. Roper (resident engineer), Mr. J. H. Dinham (chief district representative), Mr. D. Ross (commercial officer), and members of the Cardiff and District branch of the E.A.W., including Mrs. C. T. Allan and Mrs. Morley New, vice-presidents, and Mrs. J. H. Dinham, hon. treasurer.

Works Extension

A new bay has recently been added to the works at Park Royal of B.E.N. Patents, Ltd., bringing the total floor area up to 25,600 sq. ft. The company states that the extension

The works of B.E.N. Patents, Ltd., which have recently been extended

was necessary to meet the increased demand for its products. In the accompanying picture the new bay appears in the foreground.

The Levant Fair

The General Electric Co., Ltd., as part of its general propaganda in connection with the electricity schemes which are being developed in the Middle East, has co-operated with its agents in Palestine, the Consolidated Near East Co., Ltd., in arranging a comprehensive display of its electrical products at the Levant Fair. A representative selection of appliances required for use in the home is shown on the Consolidated Near East Co.'s stand, including a range of "Magnet" water heaters, fires and general appliances. Of particular interest in this section are two types of a new cooker, specially developed by the G.E.C. for such markets as this. A special display of all types of "Osram" lamps has been arranged, in conjunction with street lighting fittings, including the "Wembley" lantern. Illuminated signs, tubular heaters, and neon tubing and Osram photo-cell equipment complete the display.

For Sale

Rawtenstall Corporation Electricity Department has for sale a.c. meters.

The Northampton Electric Light & Power Co., Ltd., has for sale 3-phase 50-cycle transformers.

(See our classified advertisements.)

Lighting in a Drapery Store

A new design of electric lighting fitting has been adopted in the general lighting of an extension of the drapery store of Messrs. Harvey Nichols & Co., Ltd., Knightsbridge, W. While the lighting is indirect in principle, the units have the appearance of modern luminous panel fittings. They were designed by the Edison Swan Electric Co., Ltd., which also supplied the lamps. The installation was carried out by Messrs. Harvey Nichols' own staff under the supervision of Mr. G. Withers, chief engineer of the company.

Change of Name

The name of Electro-Medical Lamps and Neon Rays, Ltd., 66, Priory Road, Hornsey, N.8, has been changed to Electro-Medical Lamps and Neon, Ltd.

Sierra Leone Customs Revision

The revisions which came into force on April 10th under the Sierra Leone Customs Tariff (Amendment) Ordinance, 1934, include machinery for electric light and power for industrial purposes which, under the British preferential tariff, is admitted free. The general tariff is 10 per cent. *ad valorem*.

Trade Announcements

Messrs. McLeod & McLeod, Ltd., have been appointed sole distributors in the United Kingdom for the motor-drive and foot-operated automatic electric spot and butt welders of the Eisler Engineering Co., Inc., Newark, N.J., U.S.A.

Marris's, Engineers, Ltd., have commenced business at 11, Rumford Street, Liverpool, 2, to act as manufacturers' agents, and to carry out general engineering and electrical work. They ask for catalogues.

The Polish Electrical Industry

Statistics quoted by a Warsaw newspaper show that the value of the imports of electrical machinery and apparatus in 1932 amounted to 30 million zlotys, which diminished to 24 millions last year. On the other hand the value of the national production increased from 39 million zlotys to 45 millions in the two years respectively.

Russian Electrical Imports

A return lately to hand shows during last year 21,231 metric tons of electrical machinery and apparatus valued at £1,935,900 were imported into Soviet Russia, as compared with 47,471 tons valued at £6,515,200 in 1932.

Meter Approved

Measurement, Ltd., informs us that its type "Z" overload pattern single-phase watthour meter for a.c., which it has had on the market for some time, has been approved by the Electricity Commissioners.

Prices of Materials

Messrs. F. Smith & Co. report May 16th: Copper (electrolytic) bars, £36 10s., 15s. increase. Ditto, ditto, wire rods, £43 10s., £1 increase. Ditto, ditto, h.c. wire, 7⅞d., ½d. increase. Silicium bronze wire, 8$\frac{5}{16}$d., ¼d. increase.

Messrs. James & Shakespeare report May 16th: Copper bars (best selected), sheet and rod, no change. English pig lead, £12 5s., 5s. decrease. Copper (electrolytic) sheets, £36 to £36 10s., 15s. to 20s. increase.

Messrs. Edward Till & Co. report May 16th: India-rubber, Para fine, no change.

New Catalogues and Lists

David Shanks & Co., Ltd., Birmingham.—Leaflet on "Bakelain" ceiling roses with vitreous china and unbreakable covers.

Heyes & Co., Ltd., Wigan.—Catalogue of "Wigan" signalling apparatus.

Bruce Peebles & Co., Ltd., Edinburgh.—A catalogue dealing with the "Rectigor."

Thos. Allnutt & Co., Essex Works, Lee Chapel Lane, Langdon Hills, Essex.—Price list of bolts, nuts, screws, &c.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—A leaflet on latched-in a.c. contactors.

Alexander Wright & Co., Ltd., 1, Westminster Palace Gardens, Artillery Row, Victoria Street, S.W.1.—A catalogue of apparatus for indicating and recording carbon-dioxide in gases.

Johnson & Phillips, Ltd., Charlton, S.E.7.—A catalogue of new static condensers.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—A leaflet dealing with a miniature current transformer and ammeter.

Best & Lloyd, Ltd., Handsworth, Birmingham.—Leaflet illustrating the "Barman" range of lighting fittings.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.—Leaflets on model 501 cooker, "Bandolero" fans, shaving mirrors, warming plates, toasters and kettles.

Ediswan lighting fittings in a drapery store

Ferranti, Ltd., Hollinwood.—List describing electric humane stunning equipment.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester.—Leaflets on oil-circuit breakers, triple-pole gang-operated isolating switches and kiosk type sub-stations.

Direct Electric Lamp Co., Ltd., 72, Shoe Lane, E.C.4.—Particulars of the "Demon" vacuum cleaner and the "Moderne" 5-valve super-het. radio receiver.

Rowlands Electrical Accessories, Ltd., Hockley Hill, Birmingham, 18.—A catalogue of inset fires.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A leaflet on the company's electric stimulator.

J. H. Taylor & Co., Macaulay Street, Huddersfield.—A booklet describing the "Health Ray" heat-wiring system.

The Overseas Engineering Co., Ltd., 200, Bishopsgate, E.C.2.—A list of small electric lighting sets.

Aladdin Industries, Ltd., Greenford, Middlesex.—Catalogue of table lamps and floor standards.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.—A leaflet on the "Glim" tester.

Bankruptcy Proceedings

A. H. Latham and **R. C. Plant,** trading as Latham & Plant, wireless and electrical dealers, 25, Lowlands Road, Harrow.—At the first meeting of creditors held on May 9th at London Bankruptcy Buildings, accounts were submitted showing liabilities of £382 against assets of £94. The debtors stated that they started business as above in February, 1933, with a joint capital of £10, and their failure is due to lack of capital and loss of hire-purchase sets through removals of customers. The case was left in the hands of the Official Receiver.

W. S. Fray, trading as "R. E. Warren," 1, Albert Road, Torquay, Devonshire, electrician and wireless dealer.—The receiving order was made on debtor's own petition recently, and he has returned a statement of affairs which shows ranking liabilities of £602 and net assets of £76, leaving a deficiency of £526. He attributes his position to indifferent health, inexperience, losses on motor vehicles, and insufficient profit on contract work.

J. T. Thackra, 82, Market Street, Milnsbridge, near Huddersfield, wireless dealer.—The public examination was held on May 9th at the County Court, Huddersfield, and according to figures submitted there were liabilities of £205 and net assets of £58, with a deficiency of £147. Debtor attributed his failure to bad trade and keen competition. He said that in 1932 there were seven wireless shops within two hundred yards radius of his premises. The examination was concluded.

Oscar Siddall, "Clydesdale," Forty Foot, Bridlington, Yorks, plumber and electrician.—The first meeting of creditors was held on May 8th at the Official Receiver's Office, Scarborough, when it was reported that the gross liabilities amounted to £1,415, of which £714 was expected to rank for dividend. The net assets were £197, leaving a deficiency of £516. The failure was attributed to lack of capital, insufficient profit and bad debts. The case being a summary one was left in the hands of the Official Receiver, as trustee.

Rockall & Co., electrical engineers, 7-8, Ham Yard, Piccadilly, W.—Receiving order made May 3rd on a creditor's petition. Public examination June 19th at Bankruptcy Buildings, Carey Street, W.C.

E. S. Mellor, electrical engineer, 15, Cole Street, Scunthorpe.—Receiving order made May 2nd on debtor's own petition. Public examination June 7th at the Town Hall, Great Grimsby.

A. G. Overton, electrical engineer, 75A, Pasture Street, Great Grimsby.—Receiving order made May 2nd on debtor's own petition. Public examination June 7th at the Town Hall, Great Grimsby.

C. F. Richards, wireless and electrical dealer, 1, Peel Street, Kidderminster.—Receiving order made May 2nd on debtor's own petition. Public examination May 29th at the Town Hall, Kidderminster.

R. B. Emerson, electrical engineer, 330, London Road, Westcliff-on-Sea.—Public examination May 31st at the Petty Sessions House, Southend.

G. Blades, electrical engineer, 55, Hainton Avenue, and 52, Pasture Street, Great Grimsby.—Application for discharge refused.

E. Gould (Gould & Co.), electrical and radio engineer, High Street, Lee-on-the-Solent.—Trustee, Mr. C. J. Pyke, 87, High Street, Portsmouth, Official Receiver, released April 13th.

C. A. Whittington, electrician and wireless dealer, 400, Abbeydale Road, Sheffield.—First and final dividend of 2s. 1d. in the £, payable May 9th at 14, Figtree Lane, Sheffield.

J. Keddie, electrician, 90, Leander Road, Brixton, S.W.—Receiving order made May 8th on a creditor's petition. First meeting May 23rd and public examination July 19th at Bankruptcy Buildings, Carey Street, W.C.

C. T. Waterhouse, electrical engineer, 137, Smawthorne Lane, Castleford.—Receiving order made May 7th on debtor's own petition.

J. Webster, electrical and radio engineer, 65, Moss Lane, Orrell Park, and 231, Warbreck Moor, Aintree, Liverpool.—Trustee, Mr. C. E. Balmforth, 7 and 9, James Street, Liverpool, appointed May 8th.

J. F. Wisson, wireless dealer, 2, Cheapside, Deans Lane, Edgware.—Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C., Official Receiver, released April 24th.

K. Beeson, electrical contractor, 46, Main Street, Mexborough.—Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released April 18th.

W. H. J. Willcox, radio dealer, 66, Soundwell Road, Staple Hill, near Bristol.—First and final dividend of 2s. 7d. in the £, payable May 16th at 26, Baldwin Street, Bristol.

D. Boulton and **L. C. Turner** (Derek Boulton), wireless and electrical engineers, lately of Old Town Avenue, Plymouth.—First and final dividend of 9s. 2½d. in the £, payable May 18th at the trustee's office, Princess Chambers, Sussex Terrace, Plymouth.

Company Liquidations

John Kirkham, Ltd.—Particulars of claims by June 12th to the liquidator, Mr. T. Greenhalgh, 23A, Clifton Street, Blackpool.

Burrell Radio, Ltd.—Particulars of claims to the liquidator, Mr. F. H. Harper, 3-4, Clement's Inn, W.C., by June 1st.

Private Arrangement

E. C. Nicholls, 15, Broad Street, Ross-on-Wye, radio dealer.—At a recent meeting of creditors a statement of affairs was submitted showing liabilities of £1,617 and net assets of £177, leaving a deficiency of £1,440. It was decided that subject to the debtor's mother withdrawing her claim and settling the amount due to the bank, the matter should be dealt with under a deed of assignment to Mr. L. S. Findley. A committee of inspection was also appointed.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—FLOODLIGHTING.—The Town Council has accepted a recommendation of the Electricity Committee that, in connection with the meeting of the British Association in the city in September, arrangements should be made by the Corporation to floodlight some of the more important buildings in the town. The floodlighting will be continued during the conference of the Association of Public Lighting Engineers which takes place shortly after the B.A. meeting.

Accrington.—EXTENSIONS.—The Electricity Committee has prepared a scheme for extensions and the provision of plant at a cost of £12,992.

SUB-STATION.—The Committee is to obtain a site in Wheat Street for the erection of a sub-station.

BULK SUPPLY.—The Committee is considering an application from the Haslingden Corporation requesting terms for a bulk supply of electricity to the town.

Acton.—SUB-STATION.—The Metropolitan Electric Supply Co., Ltd., is to erect a sub-station in the vicinity of the Vale.

Airdrie.—NEGOTIATIONS WITH CLYDE VALLEY CO.—Regarding the future supply of electricity by the Clyde Valley Co. in place of the Coatbridge & Airdrie Electric Supply Co., Ltd., the former company has pointed out that a clause had been inserted in its draft Provisional Order as a result of opposition by the Electrical Power Engineers' Association, supported by the Minister of Transport, providing for compensation to the employés of the existing company in the event of their services not being required. The effect of such a clause would require to be considered, and, while the company was not yet in a position to submit a draft agreement, the Council was assured that it would be treated on the same basis as any arrangement which was come to with the borough of Coatbridge, it being understood that, while there would be a minimum guarantee, it would be a proportional one.

Barrow-in-Furness.—EXTENSIONS.—The Electricity Committee has decided to provide a supply to Aldingham, Baycliffe, Gleaston, Dendron, and Leece, at an estimated cost of £2,500. Mains are also to be extended at a cost of £602.

CHANGE-OVER.—It has been decided to effect a change-over to a.c. at Barrow Island at a cost of £2,350.

Blackburn.—ELECTRICITY FOR PUMPING.—The Electricity Committee has decided to give an "off-peak" supply to the Accrington District Water Board for pumping water from Rishton Colliery to the Dean Reservoir.

Bristol.—NEW EQUIPMENT.—The City Council is to spend £15,200 on additional cables, sidings, &c., at the Docks.

Canada.—QUEBEC.—The Shawinigan Water & Power Co., one of the largest power distributors in the world, has put into operation a new 160,000-h.p. hydro-electric plant at Rapide Blanc, Quebec. This is the first of a series of developments in Northern Quebec designed to yield eventually about 1,000,000 h.p., and has been completed more than a year ahead of the original schedule. Through extensive undeveloped reserves on the Upper St. Maurice River, to be drawn upon only as needed, the Shawinigan Water & Power Co. has a potential capacity of more than 2,100,000 h.p. all on a single river.

Cardiff.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains in the vicinity of Llandaff Road at a cost of £750.

Colchester.—EXTENSION.—An abnormal demand for electricity having been experienced at Easter at the Jaywick Sands Estate, near Clacton-on-Sea, the Electricity Supply Committee has undertaken works to maintain the supply at an estimated cost of £1,000.

Dartford.—SUPPLY TO HARTLEY.—The Rural District Council has consented to the West Kent Electric Co., Ltd., erecting a medium-pressure overhead line to the parish of Hartley. With reference to a supply for Kingsdown, the company has intimated that the matter is still under consideration, but up to the present the capital costs, wayleaves, and other difficulties have made it impossible to justify the extension on a commercial basis.

Dorchester.—LOAN.—The Town Council has received sanction to a loan of £6,942 in connection with the change-over. Alterations in the wiring between the Council's cut-outs and meters, &c., are to be carried out by the Council's own wiremen.

Dumfriesshire.—POSTPONEMENT OF EXTENSIONS.—Major J. G. Crabbe, of Duncow, convener of the Electricity Committee, reported to Dumfries County Council recently on the county electricity undertaking relative to an application to the Ministry of Labour for an extension until December 28th, 1935, of the period for the completion of the electricity schemes in the county in respect of which unemployment grants had been given. The distribution network, the capital cost of which would be about £300,000, embraced not less than 90 per cent. of the population of the county. Up to date 2,528 consumers had been connected. For the year he estimated that the expenditure on the operation of the scheme would be £45,000

and the income £36,000, leaving a deficit of £9,000. That would require to be made up by the assessments and would entail a rate of 6d. per £. It seemed certain, he said, that the county would be rated for electricity for a few years. What they wanted in order to reduce the deficit was more consumers.

Ealing.—SUPPLY EXTENSION.—The Electricity Committee has instructed the engineer to continue negotiations with the London Co-operative Society, Ltd., with regard to a three-phase supply to premises in South Ealing Road, with a commencing demand of 500 h.p. and an ultimate demand of 1,000 h.p., and has authorised him to inform the society that if it agrees to take this supply the Corporation will be prepared to proceed with the laying of the necessary 11,000-V three-phase ring main for the southern part of the area of supply subject to the society providing a site for a sub-station.

LOAN.—The Electricity Committee is seeking sanction to borrow £1,750 for equipment for installation in the Thorpe Hall sub-station.

Essex.—VALUATION ASSESSMENTS.—The County Valuation Committee reports that it has received a communication from the clerk to the South-West Essex Assessment Committee stating that his Committee has received numerous proposals for reductions in assessments of properties which, the occupiers claim, have depreciated in value on account of the erection of trunk lines, towers and transformer stations by electricity undertakings, and inquiring whether the Committee has any information available as to the action taken in similar circumstances in other assessment areas in the Home Counties. The Valuation Committee informed the Assessment Committee that it had no such information at its disposal, but suggested that each case should be considered on its own merits. The Assessment Committee, however, feels that this has raised a question of national application, and has accordingly instructed the clerk of the Council to communicate with the Central Valuation Committee to ask for guidance in the matter.

Gainsborough.—REDUCED CHARGES.—For the third successive year the Electricity Committee (engineer, Mr. H. Breckell) has reduced the general prices for electricity. The following briefly indicates the reductions made: Rate A/PM, 5½d. per kWh reduced to 5d.; assisted-wiring scheme, inclusive charge 7½d. per kWh reduced to 7d.; rate B, reduced from 7d. per kWh to 6½d.; rate C, first 50 kWh per quarter at 1½d. per kWh, all in excess at 1d. per kWh, reduced to first 40 per quarter at 1½d. and all in excess at ¾d. per kWh; rate E, reduced from 3d. to 2½d. per kWh; rate G, 1½d. per kWh for the first 200 kWh per quarter and all in excess 1d. per kWh, reduced to 1½d. per kWh for the first 100 kWh per quarter, all in excess 1d. per kWh; minimum charge, 8s. for each of the summer quarters and 12s. for each of the winter quarters, reduced to 7s. 6d. per quarter.

Glasgow.—SUB-STATION.—The Electricity Committee has obtained a site in Langlands Road, Govan, for the erection of a sub-station.

REDUCED CHARGES.—Various reductions in the electricity charges have been recommended by the Electricity Committee. The alterations are as follows: Two-rate and commercial tariffs, primary rate reduced from 3½d. to 3d. per kWh; domestic and commercial service tariffs, running charge reduced from ½d. to ⅜d. per kWh; power tariff, kVA rate, running charge (e.h.p.) reduced from 0.22d. to 0.18d. and l.p. from 0.24d. to 0.2d. per kWh. At a Corporation meeting Councillor Munro, convener of the Electricity Committee, referred to the reductions, and stated that they were supplying electricity at practically as low rates as those existing around the Niagara Falls. The town clerk was asked whether, having regard to the high charges paid for electricity by tenants of housing schemes and others in districts of the city supplied by the Clyde Valley Electrical Power Co., compared with the charges paid in the parts of the city supplied by the Corporation, he would state what steps could be taken to have the company's charges revised. The town clerk replied that it was necessary to secure an inquiry by the Minister of Transport. It was suggested that, in view of the fact that the Housing Committee had thousands of tenants who were being charged a far greater rate than those who were supplied by the Corporation, the Electricity Committee might make representations to the Clyde Valley Co. on the matter.

NEW MAINS.—The Electricity Committee has decided to lay distributing mains at a cost of £16,876.

PUBLICITY PAYS!—At a recent meeting of the Electricity Committee the manager reported that this year's demand showed an increase of 25 per cent. compared with the corresponding period of last year, and it was agreed to spend £2,000 on publicity.

Glossop.—PURCHASE OF UNDERTAKING.—The Town Council has approached the Urban Electric Supply Co., Ltd., with reference to the purchase of the undertaking, the price asked being £66,500. The company has offered, if the Council forgoes its option of purchase, to reduce the flat rate of 8d. per kWh to 7½d. as from July 1st next, with a further reduction of ½d. when the change-over is made, to lower the heating tariff to a flat rate of ½d. per kWh, the power rate to 3d., and to reduce the meter rents from 3s. to 2s., with reductions in the two-part tariffs. The Special Electricity Committee recommends the Council not to accede to this on the ground that the terms are not acceptable.

Guildford.—EXTENSION.—The Rural District Council has decided to raise no objection to the erection of a l.v. line at Ash by the Mid-Southern Utility Co.

Hastings.—SUB-STATION.—The Electricity Committee has obtained a site at Doleham for the erection of a sub-station.

ELECTRIC CLOCKS ON TRAM STANDARDS.—The Highways Committee has agreed to a suggestion that illuminated electric clocks should be erected on lamp or tram standards in the principal streets in the borough. The Committee has received a report from the borough electrical engineer stating that the estimated cost of fixing an 18-in. dial double-sided clock on two tramway poles at each end of the new covered promenade is £61.

Heywood.—BULK SUPPLY.—The Town Council has been informed that the cost of the bulk supply of electricity from Bury Corporation is likely to be increased. At a recent meeting it was stated that the Bury Electricity Committee had decided to reduce the charges for electricity in its own town, but was asking Heywood to pay an increased price. The suggestion was made that Heywood should approach the Lancashire Electric Power Co. or the Rochdale Corporation regarding their terms for a supply.

Keighley.—NEW SWITCHGEAR.—The Town Council is seeking sanction to expend £8,000 on new metalclad switchgear.

Kent.—SUPPLY EXTENSIONS.—The South-East Kent Electric Power Co., Ltd., has under consideration a large scheme for supplying villages between Canterbury and Sandwich. As the result of a canvass at Worth steps are to be taken to provide a supply by overhead lines.

Lowestoft.—MAINS.—The Electricity Committee has obtained sanction to borrow £5,137 for the provision of electricity mains.

Northampton.—SUB-STATIONS.—The Electric Light & Power Co., Ltd., is to erect two sub-stations in Covington Street and Balmoral Road.

Northern Ireland.—BELFAST.—The Electricity Department has decided to supply an electric saucepan as well as the usual kettle free to all users of cookers under the Department's hire service. The Department is making every effort to extend the use of electricity in the domestic sphere. The showrooms at East Bridge Street are now being extended and reconstructed and will probably be opened in the autumn. A series of lectures will be given daily throughout the winter months to all those interested in cooking by electricity. To further the scheme, the Electricity Committee has put aside £15,000 for the purchase of domestic equipment for the current year and has received a grant of £500 for general advertising purposes.

Rhodesia.—CENTRAL GENERATING STATIONS.—According to the *Financial News*, on the instructions of the Government of Southern Rhodesia, an expert report has been prepared dealing with the proposal to supply electrical energy to mines, industries, farms and private households from central generating stations. The report states that both in respect of technical and financial feasibility, the proposal is sound. On account of the existing mining activity, the present would be a very opportune time to consider the centralised supply of electricity from steam power stations.

Rushden.—EXTENSIONS.—The Rushden & District Electric Supply Co., Ltd., is to lay underground l.p. cables in Grove Street, Newton Road, Robinson Road, King's Place, King's Road, Portland Road, and Cromwell Road. Proposals submitted by the company for improved street lighting for next winter are to be discussed by Rushden Urban District Council.

Scarborough.—LOAN.—The Electricity Committee has obtained sanction to borrow £4,300 for the provision of additional switchgear at the power station.

South Africa.—NEW SCHEMES TO BE UNDERTAKEN.—Three new schemes which have been under discussion are now definitely to be carried out. The Town Council of Roodepoort-Maraisburg, Transvaal, has decided to proceed with a reconstruction scheme at a cost of £35,000. The scheme has been prepared by Mr. A. E. Elsdon-Dew, consulting engineer, in conjunction with the town engineer, Mr. W. A. Ingham. At Worcester, Cape Province, the ratepayers have sanctioned application for a loan of £16,000 for doubling the present capacity of the power station. There will be a change-over from d.c. to a.c. The ratepayers of George, Cape Province, have also sanctioned a loan which includes £11,800 for converting the electricity supply from d.c. to a.c.

Stratford-on-Avon.—NEW CABLES.—The Town Council has assented to the Shropshire, W. and S. Electric Power Co. laying an 11,000-V cable from a proposed station near the new brewery into Birmingham Road, a l.v. cable in the Birmingham, Clopton and Arthur roads, an 11,000-V cable from Manor Road Station up the Loxley Road, and a 1-V cable up Loxley Road to the pumping station.

Torquay.—LOANS.—The Electricity Committee is seeking sanction to borrow £4,000 for meters and electrical instruments, £5,000 for sub-stations and equipment, £10,000 for apparatus for hire (cookers, etc.), and £2,500 for hired wiring.

The Committee is also seeking sanction to a loan of £1,860 for cables for a supply to Inner and Outer Hope.

Workington.—CHANGE-OVER.—The Town Council has applied for a loan of £3,417 for work in connection with the change-over to a supply from the Central Electricity Board.

Traction

Blackpool.—Trolley-buses.—The Transport Committee has authorised the town clerk to include in the next Parliamentary Bill to be promoted by the Corporation a clause giving the Corporation general powers relating to trolley-buses.

Cardiff.—Trolley-buses.—The House of Commons Select Committee on Private Bills had passed all the clauses sought by the Corporation to provide and run railless trolley vehicles.

Doncaster.—Mine Railway Electrification.—Electrification of the underground railway used to convey miners to their distant workings at Harworth Colliery is being contemplated.

France.—Railway Electrification.—The *Financial Times* says that the recent joint management arrangement entered into between the Orleans Railway Company and the Midi (Southern of France) Railway Company has greatly accelerated the progress of railway electrification in south-western France. The Orleans Railway has entirely electrified its line between Paris, Orleans and Tours, a distance of 234 km. This enables the company to run electric trains with a load of 410 tons per train at a speed of 120 km. per hour. Several branch lines between the main line from Paris and Orleans to Tours are also in course of electrification. The work on these branch lines will be completed for the autumn of 1935. On the Paris Lyons and Mediterranean Company's lines electrification is proceeding at a slower pace. Up to the present the line between Culoz and Modane on the Italian frontier has been electrified.

Italy.—Light Alloy Tramcars.—Four years ago an experimental light alloy tramcar was constructed by the Officine Ferroviarie Meridionali for test on the Naples system. This experimental car was of the Peter Witt type, and was almost entirely constructed of aluminium alloy. The use of light alloys makes possible a reduction of about 3 tons in the unladen weight of the car, or about 20 per cent., compared with the normal steel construction. After four years of regular service the car was examined at the Pansilipe dêpôt of Naples on March 17th, and this inspection failed to reveal any signs of incipient corrosion or fatigue. In particular the draw gear and the coupling pivot, which are of wrought duralumin, showed no appreciable signs of wear, although under a traction shear stress from trailers. There was, however, a certain amount of wear of the step edging at the central entrance. These satisfactory results of service over a period of several years prove the suitability of light alloys for the hard service conditions of tramcar rolling stock.

London.—"Tube" Extension Wanted.—At a conference of local authorities and Chambers of Commerce at Camberwell last week a committee was formed to prepare a case for the extension of the "Underground" to Camberwell Green from the Elephant and Castle with a view to presenting it to the London Passenger Transport Board.

One of the largest private telephone exchanges in Great Britain, at Grosvenor House, Park Lane, W., has recently been reconstructed. There are 1,500 working extensions and 100 incoming lines

Middlesbrough.—Buses Replace Trams.—The tramway service operated by the Town Council between the Transport Bridge and Linthorpe is to be replaced by buses early in June.

Newcastle-on-Tyne.—Trolley-buses.—At a recent special meeting the City Council decided to promote a late Bill in Parliament to give it powers to start a trolley-bus service from the Fox and Hounds, Benwell, to Wallsend *via* City Road, a distance of more than six miles, in place of the existing tram service. The chairman of the Transport and Electricity Committee said that if they kept the trams they would be faced with an expenditure during the next two years of £40,000 for track renewal, while for the next ten years this would probably cost £90,000.

Russia.—Tramways.—At the tramway conference which has just been held in Leningrad it was stated that tramways now exist in thirty-five cities, eleven of the systems having been established in the past ten years. The length of the lines has been increased in the same period from 69 miles to 123 miles, and the number of passengers carried from 554 millions to 3,876 millions. Five new tramways are to be opened in the present year. In Leningrad new four-axle cars are being constructed.

Tasmania.—Launceston.—The annual report of the Tramways Dept. (engineer, Mr. R. J. Strike) shows that the total revenue for the year ended June 30th, 1933, was £48,947, an increase of £525 as compared with the previous year. The working expenses amounted to £36,359 (£3,124 less) and the surplus to £1,311 (£3,868 more). The number of passengers carried was 4,152,204 (126,051 less) and the car mileage was 504,283 (2,353 less).

Communications

France.—Broadcasting Developments.—According to *The Wireless World*, the 65,000,000 fr. voted by Parliament in 1931 has been allocated to the purchase of Radio-Paris and the construction of seven transmitters, namely: Villejust, Paris (120 kW); Tramoyes, Lyons (100 kW); Antibes, Côte d'Azur (60 kW); Realtor, Marseilles (100 kW); Muret, Toulouse (120 kW); Thouries, Rennes (120 kW); and Camphin, Lille (60 kW). New credits are required for the Paris "Radio House," studios in the provinces, and many power increases.

Great Britain.—Radio Licences.—During April, the Post Office issued 404,800 wireless receiving licences. This figure represents an increase of 51,300 during the month, after making allowance for expired licences and renewals. The total number of licences in force at the end of April was 6,305,714, compared with 5,535,843 at the end of the corresponding month last year.

India.—Broadcasting in Hyderabad.—The scheme for broadcasting in Hyderabad is now taking definite form. A broadcasting board has been formed comprising three members of the Executive Council, with Sir Akbar Hydari as chairman. The proposed scheme will cost about £22,500, and it is understood that its organisation will be in the hands of Mr. Mahboob Ali, superintendent of the railway mail service, who is an amateur radio expert. The main station will be at Hyderabad, with relay stations in Warangal, Aurangabad, and Gulbarga, through which daily programmes in English and the vernacular will be broadcast throughout the State from Hyderabad.

Scotland.—Site for New B.B.C. Station.—The B.B.C. announces that a site near Burghead has been chosen for the new transmitting station in the North of Scotland. Several months of testing have been necessary in order to find a position from which the maximum number of potential listeners falling outside the northern limit of good service from the Scottish Regional station at Westerglen can be served. Following the procedure adopted for other regional stations, a mobile transmitter of comparatively low power has been erected on several sites and an estimate of the efficiency in each case has been obtained by making measurements of the strength of reception all over the region concerned. A motor van equipped with wireless measuring apparatus has travelled over seven thousand miles in carrying out this survey to guide the B.B.C. in choosing a position.

South Africa.—Radio Development.—It is revealed in the Loan Estimates that eleven new radio stations are to be erected by the Government in various parts of the Union. Most of these will be equipped with direction-finding apparatus, which will be used chiefly in the safe navigation of aircraft operating within the Union. A sum of £39,000 is to be spent on the equipment of these stations alone. The high-powered station at Roberts Heights will be linked with overseas stations, and that at Durban will undertake ship-to-shore telephony for the use of the general public. The situation of at least five of the new stations has been decided, namely, Durban, East London, Port Elizabeth, Kimberley and Pietersburg. With the completion of this programme the Government will possess eighteen radio stations. It is stated that the Union Government is likely to consider taking over the broadcasting services or that these may become a public utility concern. Mr. Lenten, the Postmaster-General, who is returning from London about the end of this month, has collected important information from the B.B.C., and it has been mooted that Sir John Reith may be invited to visit South Africa to investigate the problems and potentialities of broadcasting there.

Telephone Extensions and Improvements.—The South African Budget provides for £261,000 for general extensions and reconstruction work in connection with the telegraph and telephone systems. In his Budget speech Mr. N. C. Havenga, Minister of Finance, said there was an increase of £52,000 in the revenue from telegraphs and of £110,000 from telephones. After allowing for all charges, it was anticipated that the department's commercial account would show a credit balance of £540,000 for the past year.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Ashford.—Electricity Department. One year's supply of h.p. and l.p. cables. (See this issue.)

Australia.—BRISBANE.—June 8th. City Council. Traction sub-station equipment. (A.Y. 12283.)*

MELBOURNE.—Posts and Telegraphs Department. June 26th. Battery and magneto P.B.X. cordless type, table pattern telephone switchboards. (A.Y. 12317.)*

June 12th. Telephone switches. (A.Y. 12346.)*

June 19th. Multiple-twin lead-covered telephone cable. (A.Y. 12345.)*

June 18th. City Council. Electrically driven centrifugal pump. (G.Y. 13707.)*

State Electricity Commission of Victoria. June 4th. Supply for twelve months of v.i.r. cables. (A.Y. 12347.)*

Barking.—May 29th. Electricity Department. 6,600-V switchgear and l.p., a.c. and d.c. switchgear. (May 11th.)

Barnes.—June 12th. Electricity Department. Glass-bulb mercury vapour rectifier plant. (May 11th.)

Batley.—Electric lighting installation at three schools. Particulars from Education Office.

Carlisle.—June 8th. Electricity Department. Transformers. (See this issue.)

Croydon.—June 4th. Corporation. Rubber-insulated cables and meters for period July 1st, 1934, to March 31st, 1935. (See this issue.)

Cupar.—May 28th. Fife District Asylum. Installation of electric lighting and power in dwelling houses and farmstead at Springfield Farm. Specifications, &c., from Resident Clerk of Works; tenders to Medical Superintendent.

Dunfermline.—May 29th. Town Council. Various works, including electric lighting, at twenty-six houses. Schedules from D. H. Shaw, burgh engineer, City Chambers (deposit £1 1s.); tenders to Town Clerk.

Edinburgh.—May 28th. Managers of the Royal Infirmary. Various works, including electrical and heating installation, at new Dermatology and Special Pavilion, &c. Schedules from Works Department Office; tenders to H. Maw, secretary and treasurer.

Egypt.—CAIRO.—July 12th. Ministry of the Interior. Material required for the extension of the electrical network at Mehalla el Kobra. (A.Y. 12361.)*

June 14th. Material required for electric lighting installation for Toukh. (A.Y. 12317.)*

Exeter.—May 26th. Devon County Council. Vehicle-actuated traffic signals at Paignton. Specifications from County Surveyor, 18, Cathedral Yard.

Farnworth.—May 31st. Electricity Department. L.p. cables, wiring accessories and a.c. meters. (See this issue.)

Finchley.—May 28th. Electricity Department. Stoneware conduits. (See this issue.)

Glasgow.—May 21st. Cleansing Department. Thirty-six traction batteries for electric refuse wagons. Forms from Director of Cleansing, 20, Trongate; offers to Town Clerk.

India.—TRAVANCORE.—June 4th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c. (February 9th.) Date extended from May 7th.

July 9th. 66, 33 and 11-kV circuit lines. (April 20th.)

Inverness.—June 1st. District Asylum Joint Committee. Electrical generating plant at the Asylum. Schedules, &c., from R. Gilbert, clerk, 20, Church Street.

Irish Free State.—DUBLIN.—May 30th. Port and Docks Board. Two four-ton level-luffing electric portal wharf cranes. Specifications from Engineer, East Wall (deposit £1).

June 5th. Joint Committee of Grangegorman Mental Hospital. Overhaul of the electrical installation at Portrane Mental Hospital. Specifications from J. P. Tierney & Co., 44, Kildare Street (deposit £5 5s.); tenders to J. J. Doyle, Grangegorman Mental Hospital.

Keighley.—June 5th. Electricity Department. Metal-clad e.h.p. switchgear. (May 11th.)

Kingston-on-Thames.—May 18th. Electricity Department. Supply for two years of l.p. and e.h.p. cable, cable boxes, straight sockets and compound. (May 11th.)

London.—STEPNEY.—June 4th. Supply for one year of meters, demand indicators, and combined meters and demand indicators, conduits, troughs and covers. (April 27th.)

BATTERSEA.—June 6th. Borough Council. Four e.h.p. feeder switches. (See this issue.)

ISLINGTON.—June 7th. Borough Council. Electrical installation at City and Queen's Mansions, Holloway. (See this issue.)

H.M. OFFICE OF WORKS.—May 25th. Electric lamps. May 11th.)

L.C.C.—May 28th. Oil-driven and electrical sewage pumping sets. Particulars from Chief Engineer (A), County Hall, Westminster Bridge (deposit £5).

POPLAR.—May 24th. Borough Council. One 6,000-kW turbo-alternator, complete with condensing plant and spares. (May 4th.)

Middlesbrough.—Town Council. Electric lighting of the Marske Summer School. Particulars from S. Moffett, director of education, Education Offices.

Newport (Mon).—May 19th. Electricity Department. 6,000-V, 3-phase switchgear. (April 27th.)

New Zealand.—WELLINGTON.—Public Works Department. May 29th. One 33-kV oil-immersed circuit-breaker. (A.Y. 12276.)* Three single-phase potential transformers. (A.Y. 12274.)*

June 5th. 50-V storage battery and charging equipment. (A.Y. 12245.)*

June 26th. Battery-charging equipment. (A.Y. 12273.)*

Post and Telegraphs Department. July 3rd. Telephone instrument and switchboard cords. (A.Y. 12363.)*

July 4th. Telephone keys and key-mountings. (A.Y. 12366.)* Metal-cased condensers. (A.Y. 12364.)*

Perth.—May 21st. Town Council. Various works, including electric lighting, for 214 houses. Schedules from Burgh Surveyor (deposit £1); tenders to R. Adam, Town Clerk.

Portland.—May 26th. U.D.C. Turbine borehole pump and a.c. motors, Diesel engine and alternator, and transformer and switchgear. (April 27th.)

Sheffield.—June 4th. Electricity Department. Two 30,000-kW turbo-alternators, complete with condensing plant and auxiliaries, and six 150,000 lb. water-tube boilers with associated equipment. (May 4th.)

Shipley.—June 12th. Electricity Department. E.h.p. and l.p. cables. (See this issue.)

South Africa.—JOHANNESBURG.—June 1st. Government Supplies Board. Telephone cables, loading coil pots and lead jointing sleeves. (A.Y. 12348.)*

Private branch exchange switchboards for automatic telephone exchanges. (A.Y. 12351.)*

Municipality. June 14th. Supply of electric lamps for twelve months commencing September 1st. (A.Y. 12369.)* Three sets of vehicle-actuated road traffic signals and three sets of fixed time interval signals. (A.Y. 12370.)* Six three-phase drop-down type switchboard cubicles. (A.Y. 12375.)* One four-unit and one seven-unit metal-clad l.p. a.c. switchboards. (A.Y. 12374.)*

Railways and Harbours Administration. May 28. One electrically driven 150-ton single-track traverser. (A.Y. 12368.)*

PRETORIA.—Government Supplies Board. June 15th. One stationary battery. (A.Y. 12373.)*

Southport.—Electricity Department. Transformers, e.h.p. and l.p. switchboards. (See this issue.)

Stonehaven.—May 24th. Town Council. Converting public lamps to electric lighting, including the supply of lamps, fittings, brackets, service cables, &c. Specifications from A. Bell, Millburn Street, Aberdeen; offers to Town Clerk.

Sutton Coldfield.—May 24th. Electricity Department. E.h.p. switchgear and transformer kiosks. (May 4th.)

Uruguay.—MONTEVIDEO.—June 4th. State Electricity Supply and Telephones Administration. Seventy-eight three-phase oil-cooled transformers for outdoor use. (A.Y. 12354.)*

Wallasey.—May 28th. Corporation. Electrically propelled tower wagon. (May 11th.)

Walton and Weybridge.—May 31st. Electricity Department. 605 yards of 11,000-V and 1,700 yards of 660-V cables. (May 11th.)

Weymouth & Melcombe Regis.—June 15th. Electricity Department. 11,000-V overhead and underground line and l.p. overhead lines. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Ashby Woulds.—Urban Council. Accepted. Installing electric lighting at Council houses (£175).—Leicestershire and Warwickshire Electrical Power Co.

Barrow-in-Furness.—Electricity Committee. Accepted. Voltage regulator (£104) and static balancer (£22).—Ferranti, Ltd. Heater elements and air seals (£172).—J. Howden & Co., Ltd. Electric cookers (fifty each).—English Electric Co., Ltd.; Revo Electric Co., Ltd.; Simplex Electric Co., Ltd.

Blackpool.—Electricity Committee. Accepted. Meters for twelve months.—Aron Electricity Meter, Ltd.; Ferranti, Ltd.; Measurement, Ltd.; Landis & Gyr, Ltd.; Chamberlain & Hookham; and Metropolitan-Vickers Electrical Co., Ltd. Overhead line to Marton.—Pirelli-General Cable Works, Ltd.

Cardiff.—Health Committee. Accepted. Cinema apparatus for mental institution (£330).—British Thomson-Houston Co., Ltd.

Electricity Committee. Accepted. Cable.—Telegraph Construction & Maintenance Co., Ltd.; Edison Swan Cables, Ltd.; Pirelli-General Cable Works, Ltd.; British Insulated Cables, Ltd. Switchgear.—J. G. Statter & Co., Ltd. (£956); Allen West & Co., Ltd. (£312).

Carlisle.—Corporation. Accepted. Switchgear for substations.—Long & Crawford; Metropolitan-Vickers Electrical Co., Ltd.; Switchgear & Cowans, Ltd.

Clacton-on-Sea.—Urban District Council. Accepted. Kiosk with switchgear and transformers.—Crompton Parkinson, Ltd.

Douglas (I.o.M.).—Electricity Committee. Accepted. Switchgear (£694).—New Switchgear Construction Co., Ltd. One 500-kVA and two 25-kVA transformers (£287).—Bruce Peebles & Co., Ltd.

Glasgow.—Health Committee. Accepted. Annual supply of electrical fittings for various hospitals.—General Electric Co., Ltd. X-ray apparatus at Stobhill and Eastern and Western District Hospitals (£1,032).—Newton & Wright.

Housing Committee. Accepted. Electrical work at Sunnybank Street rehousing scheme (£323).—R. J. McIntyre.

Lighting Committee. Accepted. Annual supply of electrical fittings and accessories.—Sloan Electrical Co., Ltd.; British Electrical & Manufacturing Co., Ltd.; L. Andrew & Co., Ltd.; Holland House Electric Co., Ltd.; W. Brown & Co., Ltd. Cable.—British Electrical & Manufacturing Co.

Municipal Transport Committee. Accepted. Electro-magnetic brakes.—Electro-Mechanical Brake Co., Ltd. Traction equipments. G.E.C. Controllers for traction equipments.—English Electric Co., Ltd. Regenerative control equipments.—British-Thomson Houston Co., Ltd. Air brake equipment.—Westinghouse Brake & Saxby Signal Co., Ltd.; Electro-Mechanical Brake Co., Ltd.

Police Committee. Accepted. Electrical work at Recruits' Training Centre (£2,232).—J. Stewart Denholm. Two electric lifts at the Central Police Office (£694).—Glasgow Engineers, Ltd.

Hastings.—Electricity Committee. Recommended. Supply of electric cookers for twelve months.—Jackson Electric Stove Co., Ltd.

London.—FULHAM.—Electricity and Lighting Committee. Recommended. Steel kiosk sub-station and equipment at Fulham Road (£750), switchgear for sub-station at Avonmore Road (£210).—Crompton Parkinson, Ltd. Accepted. One 20-ton overhead electric travelling crane in connection with the power station extensions.—Sir William Arrol & Co., Ltd.

HACKNEY.—L.C.C. Accepted. Electrical installation in dwellings on the Northwold estate (£155).—Hall & Stinson, Ltd.

Works Committee. Recommended. Traffic signals.—Automatic Electric Co., Ltd.; Laurence, Scott & Electromotors, Ltd.

L.C.C.—Hospitals and Medical Services Committee. Accepted. Electric lighting and power, clock and telephone installations at Bethnal Green Hospital (£300).—Harland & Wolff, Ltd. Wiring and fittings for electric lighting at Hammersmith Hospital (£278).—Francis Polden & Co., Ltd. Electric lifts at Highgate Hospital (£1,298).—Evans Lifts, Ltd. Electric wiring for cold storage plants at six hospitals.—J. & E. Hall, Ltd.

Lybster.—Accepted. Electric lighting fittings at new school (£225).—John O'Groats Motor & Electric Co.

Margate.—Town Council. Accepted. Electric passenger lift at Queen's Promenade (£1,185).—Waygood-Otis, Ltd.

Motherwell.—Town Council. Accepted. Electric lighting at thirty-six houses at Milton Street.—S. Harvie.

Portsmouth.—Watch Committee. Accepted. Automatic traffic signals at two junctions (£784).—Automatic Electric Co., Ltd.

Prestonpans.—Town Council. Accepted. Electric lighting at sixteen houses at Harlawhill housing scheme.—Lothians Electric Power Co.

Salford.—Watch Committee. Accepted. Vehicle-actuated traffic control signals and pedestals, including accessories (£544).—Automatic Electric Co., Ltd.

Swansea.—Electricity Committee. Accepted. Transformers for Tir John power station (£8,568).—Metropolitan-Vickers Electrical Co., Ltd. Cables for twelve months.—Callender's Cable & Construction Co., Ltd.; Pirelli-General Cable Works, Ltd.

Warrington.—Electricity Committee. Accepted. Transformers.—Electric Construction Co., Ltd.

Wolverhampton.—Electricity Committee. Accepted. One 600-kVA transformer (£220).—Electric Construction Co., Ltd. Cables for twelve months (schedule prices).—Callender's Cable & Construction Co., Ltd.

Workington.—Town Council. Accepted. Two 500-kVA transformers (£1,112).—Ferranti, Ltd. Switchgear (£639).—Switchgear & Cowans, Ltd. Underground link boxes and overground feeder pillars (£99).—W. T. Henley's Telegraph Works Co., Ltd.

Forthcoming Events

Institution of Electrical Engineers (*Mersey and North Wales (Liverpool) Centre*).—Wednesday, May 23rd. Benevolent Fund golf competition. (*Wireless Section*).—Saturday, May 26th. Summer visit to Droitwich. (*London Students' Section*).—Saturday, June 2nd. Summer outing. Tour of the electrification scheme of the Southern Railway. (*South Midland Centre*).—Wednesday, July 4th. Summer meeting. Visit to Messrs. Callender's cable works.

Incorporated Municipal Electrical Association.—May 28th-June 2nd. Liverpool. Annual Convention.

Overhead Lines Association.—Saturday, June 2nd. Summer meeting. Visit to Stourport power station.

Tramways, Light, Railway, and Transport Association.—May 23rd-25th. Annual Congress at Southend-on-Sea.

Institution of Heating and Ventilating Engineers.—June 18th-20th. Summer meeting at Queen's Hotel, Hastings.

Electrical Contractors' Association.—June 27th-29th. Annual conference at Buxton.

Makers' Names Wanted

ADRI pad for absorbing moisture.
ELEKTOR vacuum cleaner.
MITCHELL plug tester.
COLUMBIA red label No. 6 dry cell.

Notes

Generation of Electricity in April

The official returns rendered to the Electricity Commissioners show that 1,187 million kWh was generated by authorised undertakers in Great Britain during April, as compared with the revised figure of 953 million kWh in the corresponding month of 1933, representing an increase of 234 million kWh or 24.5 per cent. The number of working days in the month (*i.e.*, excluding Sundays and Bank Holidays) was twenty-four, as against twenty-three last year. During the first four months of 1934 up to the end of April, the total amount of electricity generated by authorised undertakers was 5,456 million kWh, as compared with the revised figure of 4,605 million kWh for the corresponding period of 1933, representing an increase of 851 million kWh, or nearly 18.5 per cent. The following table shows the output for the first four months of the year.

	1933. kWh (millions)	1934. kWh (millions)	Inc. per cent.
Jan.	1,336	1,536	14.8
Feb.	1,151	1,343	16.5
March	1,160	1,390	19.6
April	952	1,187	24.5

Ventilating Engineers' Summer Meeting

The summer meeting of the Institution of Heating and Ventilating Engineers will be held at Hastings from June 18th to 20th. Mr. A. F. Dufton is to read a paper on "Some Heating and Ventilating Problems," and an attractive programme of social and recreational events has been arranged.

The O.L.A. Summer Meeting

Preliminary details of the one-day summer meeting of the Overhead Lines Association show that members will have the choice of staying overnight at Droitwich or Birmingham, where motor coaches will call for them on the morning of June 2nd and then proceed to Stourport for an inspection of the power station, outdoor switchgear and sub-station and overhead lines of the Shropshire, Worcestershire and Staffordshire Power Co. After luncheon at British Camp, Malvern Hills, there will be an opportunity for golf on the Worcester course, the remainder of the party making a tour to Evesham for tea and returning to Birmingham *via* Stratford-on-Avon.

"The True Road to Radio"

We find that the book entitled "The True Road to Radio," by A. Hall (chief radio engineer, Ferranti, Ltd.), which was published several years ago at 5s., is now out of print. This publication was a good example of the best form of technically informative publicity as it is to be found in public libraries and scientific institutions in many parts of the world and has even been adopted as a text book by correspondence colleges. While this appreciation of the work as indicated by the distribution of a complete edition of 20,000 copies, is no doubt gratifying to Messrs. Ferranti, Ltd., it will be unfortunate for the electrical public if no further edition is published, especially in view of the developments since the first edition was issued, many of which are due to the work of the company's technical staff.

The "Velox" Boiler

The paper which Mr. M. G. S. Swallow read recently at the North-Western branch of the Institution of Mechanical Engineers at Manchester, dealing with the serviceability, reliability, and mechanical soundness of steam generators of the "Velox" type already in actual industrial service, has been reprinted in brochure form. A limited number of copies is available to responsible engineers who apply for them to Richardsons Westgarth-Brown Boveri, Ltd., Hartlepool Engine Works, Hartlepool.

I.E.E. Golf Competition

The annual golf competition for the Dennis Trophy, the proceeds of which are devoted entirely to the Institution of Electrical Engineers' Benevolent Fund, will be played at the beginning (not the end) of the I.M.E.A. Convention week on the Woolton golf course at Liverpool, commencing after luncheon on May 26th (not June 2nd as stated in the official programme) and terminating at 5 p.m. on May 31st. The entrance fee is 2s. 6d. per card with an optional sweep of 1s. As many cards as possible should be taken out and those who are unable to enter may still send their 2s. 6d. to Mr. R. N. Torpy, golf secretary, Stork Hotel, Liverpool, which will be duly acknowledged and entered in the book.

Appointments Vacant

Assistant master at Leyton Technical College.

Lady demonstrator and showroom assistant for Colchester Electricity Department.

Second mains assistant for St. Pancras Electricity Department.

Visiting teachers in electrical installations, workshop electricity and electric welding for L.C.C. evening classes.

Temporary sales engineer for Fulham Electricity Department.

Electrical and general engineer for the Pier and Foreshore Department of Southend-on-Sea Corporation.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. L. L. Horrell, city electrical engineer of Pretoria, and **Mr. M. G. Nicholson,** the town clerk, have returned to South Africa after placing contracts in this country for plant for the municipal power station extensions.

Miss M. A. Buckler, travelling lecturer and demonstrator with the General Electric Co., Ltd., has been appointed showroom assistant and demonstrator by Dover Town Council.

Mr. S. R. Mullard, of the Mullard Radio Valve Co., Ltd., has been nominated chairman of the Wireless Section of the Institution of Electrical Engineers for the 1934-35 session.

Sir Richard Redmayne was elected president of the Institution of Civil Engineers, in succession to Sir Henry Maybury, at the recent annual meeting of the Institution.

Mr. F. Gill, chairman of Standard Telephones & Cables, Ltd., and of Creed & Co., has been elected chairman of Kolster Brandes, Ltd. Mr. S. Wilding Cole will retain the office of deputy chairman; the other members of the board are Mr. G. Hurford, managing director, Mr. L. C. Morrison and Mr. W. J. Bull.

Mr. K. N. Eckhard was elected chairman of the Argentine Local Centre of the Institution of Electrical Engineers at the recent annual general meeting. **Mr. H. C. Siddeley** was elected vice-chairman; Mr. R. G. Parrott, honorary secretary and treasurer; and Messrs. F. Harris, R. Wright, G. Munday, D. Parsons, H. McPhail, A. Risso and W. Wheeler members of the committee.

I.E.E. Awards.—The Council of the Institution of Electrical Engineers has made the following award of premiums for papers read during the session 1933-34, or accepted for publication:—Institution Premium: Messrs. W. Kidd and J. L. Carr. Ayrton Premium: Messrs. B. A. G. Churcher, A. J. King, and H. Davies. Fahie Premium: Mr. T. S. Skillman. John Hopkinson Premium: Dr. W. G. Thompson. Kelvin Premium: Mr. B. L. Goodlet. Paris Premium: Messrs. J. L. Miller and J. E. L. Robinson. Webber Premium: Mr. G. Shearing. Overseas Premium: Mr. S. P. Chakravarti. Extra Premiums: Dr. M. A. B. Brazier, Capt. B. S. Cohen, Messrs. C. W. Marshall, P. D. Morgan, W. G. Radley, S. Whitehead, and H. Rissik. *Wireless Section Premiums.*—Duddell Premium: Mr. T. Walmsley. Extra Premiums: Messrs. L. H. Bedford, O. S. Puckle, E. B. Moullin, H. D. M. Ellis, and A. H. Reeves. *Meter and Instrument Section Premiums.*—Silvanus Thompson Premium: Dr. A. H. M. Arnold. Extra Premiums: Dr. E. Mallett, Messrs. J. B. Lees and G. F. Shotter.

The Willans Premium, which is awarded triennially alternately by the Institution and the Institution of Mechanical Engineers for the best paper read, since the last award, dealing with the utilisation or transformation of energy treated especially from the point of view of efficiency or economy, has been granted to Mr. D. B. Hoseason for his paper on "The Cooling of Electrical Machines."

Col. A. S. Angwin, assistant engineer-in-chief, G.P.O., and Mr. Noel Ashbridge, chief engineer, B.B.C., who are members of the P.M.G.'s Television Committee. **(See page 711)**

Mr. H. F. Shanahan, chief mains engineer at Blackpool, has been appointed by the Corporation Electricity Committee chief assistant engineer at a salary of £605 per annum. **Mr. E. Donoghue,** senior charge engineer, has been appointed works superintendent at a salary of £456.

Mr. A. A. Smith, acting interim general manager of the Aberdeen Corporation Transport Department, has been appointed general manager at a salary of £750, rising to £900.

Mr. H. R. Harper, chief engineer of the Victoria Electricity Commission, has been re-elected chairman of the Institution of Engineers (Australia), Melbourne division.

Mr. F. C. Dain, superintendent of the electricity showrooms at Leyton, who is taking up a similar position at Coventry, has been presented by his colleagues with a hall wardrobe, a bureau, and a coffee percolator.

Mr. John T. Bing, who has been on the staff of the Derby Corporation Electricity Department since 1895, has retired, and has received presentations from his colleagues.

Mr. H. T. Rice, general manager—London and Export—of the English Electric Co., Ltd., has been elected to a seat on the board of that company. Mr. Rice became connected with Messrs. Dick, Kerr & Co., Ltd. (which now forms part of the English Electric Co.) early in 1901 in connection with the contract which the company was carrying out in Calcutta for the electrification of the system of the Calcutta Tramways Co., Ltd. After serving its interests in the Far East for a number of years, he was appointed export manager in London of the English Electric Co., Ltd., on its formation in 1919, and has continued with it in this capacity, being appointed in addition general manager for the company in London about three years ago.

[*Elliott & F*

Mr. H. T. Rice

Mr. A. de Turckheim, who has been secretary to the National Joint Industrial Council for the Electricity Supply Industry since its formation in 1919, resigned his secretaryship on April 30th. At a meeting of the council held on May 11th, Mr. J. Rowan, the newly elected chairman, paid a tribute to the services rendered by Mr. de Turckheim, and spoke of the happy personal relationship which had always existed between him and all members of the council. Alderman Walker, as vice-chairman, expressed his full support of Mr. Rowan's expressions. Mr. de Turckheim thanked the chairman and vice-chairman and all members for the good feelings expressed to him, and assured them that he would preserve happy recollections of his work with the council. The council then considered the question of future organisation, and decided that it would not appoint an official to replace Mr. de Turckheim. The employers appointed Mr. A. H. Banks to be their industrial adviser in 1931, and for many years Alderman G. P. Dean has been secretary to the trades union side. Messrs. Banks and Dean will in future collaborate in carrying out jointly the secretarial and administrative duties in connection with the work of the council. The official address of the council is now 2, Mount Street, Manchester, 2.

Mr. J. D. Knight, the borough electrical engineer of Ealing, is retiring in July, as we have already announced, and the Corporation Electricity Committee proposes to make him a retiring allowance of £780 per annum, and to appoint him honorary consulting engineer.

Mr. A. E. Ratcliffe, of Lowestoft, has been appointed by Ealing Corporation Electricity Committee as showroom assistant.

Obituary

Mr. E. N. Appelbee.—The death occurred recently in his sixty-eighth year of Mr. Edward Neville Appelbee, who for thirty-two years was borough electrical engineer at Ashton-under-Lyne, retiring from that position in August last owing to ill-health. He was, however, consultant to the Council until his death. Following his apprenticeship he was engaged in the installation of electrical plant in various parts of the country, including lighting installations on board liners which sailed from the Port of London. He held positions with the St. James' and Pall Mall Electric Supply Co. and the City of London Electric Lighting Co., and later was appointed chief electrical engineer at Cardiff, leaving there in 1901 to take over the control of the Ashton-under-Lyne electricity undertaking. On his retirement his assistant, Mr. T. E. Daniel, became chief electrical engineer.

Mr. A. C. Freeman.—The death occurred suddenly, in Glasgow, on May 8th, at the age of sixty-three, of Mr. Andrew Crichton Freeman, one of the pioneers in this country in the use of electricity for outdoor illuminations. For some years past he had been manager of Messrs. John McNicol & Co., electrical engineers.

Mr. James Carlton Stitt, LL.D., a former director of British Insulated Cables and its predecessors, died at Liverpool on May 13th.

Will.—Mr. C. W. D. Bourne, managing director of Messrs. Whipp & Bourne, left £68,598 (net personalty £67,683).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Tricity Cookers, Ltd.—Private company. Registered May 11th. Capital, £20,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in all kinds of appliances, devices, machinery and equipment, whether electrical or otherwise, for domestic or industrial purposes, &c. The subscribers are: C. G. Maby, 2, Cleveland Gardens, W.2, and J. B. Whelan, 341, Uxbridge Road, Acton, W.3. The first directors are not named. Registered office:- Wellington House, 125-130, Strand, W.C.2.

Hope, Norman & Co., Ltd.—Private company. Registered May 11th. Capital, £500 in £1 shares. Objects: To acquire the business of manufacturers and retailers of wireless and electrical goods and repairing and servicing of wireless sets and the installation and repair of electrical circuits, &c., now carried on by K. Dawkins and N. R. B. Tebbitt at 85, Westbourne Grove, Bayswater, W.2, as "Hope, Norman & Co." The permanent directors are: N. R. B. Tebbitt, 96, Westbourne Park Road, W.2, and K. Dawkins, 141, Delaware Mansions, Delaware Road, W.9. Registered office: 85, Westbourne Grove, W.2.

General Radio & Electrical Supply Co., Ltd.—Private company. Registered May 11th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a dealer in electrical and mechanical appliances, musical and scientific instruments and accessories of all kinds, wireless, telephonic and telegraphic apparatus and sundries, &c., now carried on by Bertram Davis at 5, Station Parade, Barking, and elsewhere. The first directors are: B. Davis and Gertrude Davis, both of 197, South Park Drive, Ilford. Registered office: 5, Station Parade, Barking, Essex.

Portable Distributors, Ltd.—Private company. Registered May 11th. Capital, £100 in 2s. shares. Objects: To carry on the business of manufacturers, importers and exporters of and wholesale dealers in radio products, &c., and to act as dealers under hire-purchase agreements. The first directors are: L. Apple (chairman and permanent director), 36, Corringham Road, Golders Green, N.W., and M. Apple, 36, Corringham Road, Golders Green, N.W. Registered office: Sceptre House, 169, Regent Street, W.1.

Super Radio (Whitechapel), Ltd.—Private company. Registered May 10th. Capital, £100 in £1 shares. Objects: To carry on the business of wholesale or retail wireless distributors, manufacturers of all kinds of wireless and electrical equipment, including talking picture and television equipment, &c. The first directors are: F. S. Freeman, and Mrs. Grace M. Freeman, both of "Bronwyd," Sandfield Park, Liverpool, (both directors of Super Radio (Liverpool), Ltd.). Secretary: Miss Ailsa Fleet. Registered office: 66, Whitechapel, Liverpool.

Allwave International Radio & Television, Ltd.—Private company. Registered May 9th. Capital, £1,500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio, television, telephone and telegraph instruments and apparatus, &c. The first directors are: A. T. M. Lane, Craiglure, 23, Overbury Avenue, Beckenham, and three others. Registered office: 4a, Wimbledon Hill Road, Wimbledon, S.W.

John Bennie (1934) Ltd.—Private company. Registered in Edinburgh May 5th. Capital, £5,000 in 1,000 7½ per cent. cumulative preference and 4,000 ordinary shares of £1 each. Objects: To carry on the business of manufacturers of lifts and elevators, escalators and moving staircases, engineers, brassfounders, electrical engineers, &c. The first directors are: A. E. Fletcher, Northford, Ardrossan, H. Marryat, 40, Hatton Garden, London, E.C.1, and M. D. Scott, 75, Clerkenwell Road, E.C.1. Registered office: 151, Moncur Street, Glasgow.

Arctic Fan & Electrical Co., Ltd.—Private company. Registered May 2nd. Capital, £100 in £1 shares. Objects: To carry on the business of vendors and manufacturers of electrical appliances, electricians, &c. The life governing director is A. Knowles, Acreback, Whitehead, Co. Antrim. Registered Office: 48, Beak Street, W.

Interocean Radio, Ltd.—Private company. Registered on May 2nd. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus and accessories, radio sets, valves, &c. The permanent directors are: J. Crossman, 14, Hallam Street, W.1; and J. Miranda, 47, Dudley Court, Upper Berkeley Street, W.1. Registered office: 16, Albemarle Street, W.1.

Lackmakers (Radio), Ltd.—Private company. Registered May 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and wholesale and retail dealers in wireless receiving and transmitting sets, radio-gramophones, &c. The subscribers are: J. Lackmaker, 32, Clifton Flats, Shoreditch, E.1; and L. Lackmaker, 22, Clifton Flats, Shoreditch, E.1. Registered office: 223, High Street, Shoreditch, E.1.

Public Address Corporation, Ltd.—Private company. Registered May 2nd. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio in all its branches, suppliers of electrical goods, &c. The directors are: P. Kay, wireless factor, and Mrs. C. Kay, both of 172, Chase Side, Southgate, N.14. Registered office: 167, City Road, E.C.1.

Rayner Brothers (1934), Ltd.—Private company. Registered May 5th. Capital, £1,000 in £1 shares (900 7 per cent. cumulative preference and 100 ordinary). Objects: To acquire the business of electrical and radio engineers and dealers carried on by E. H. Rayner and L. J. M. Rayner at 147, High Street, Scunthorpe, Lincs, as "Rayner Brothers." The permanent directors are: E. H. Rayner (managing director) and L. J. N. Rayner, both of The Beeches, Webster Avenue, Scunthorpe. Secretary: J. E. Osborne, Parliament Chambers, Parliament Street, Hull.

Lamp Trades, Ltd.—Private company. Registered May 5th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wholesale suppliers of electric lamps, dealers in electrical materials, aircraft, radio, wireless and television apparatus and automobiles, &c. The first directors are: C. C. Roloff, 73, Argyle Road, West Ealing, W.13; and W. H. C. Hatch, 1, North View, Ealing, W.5.

Cheshire Cables, Ltd.—Private company. Registered May 7th. Capital, £12,500 in 10,000 ordinary shares of 5s. and 10,000 7 per cent. cumulative preference shares of £1 each. Objects: To carry on the business of manufacturers of electric wires and cables, electric, magnetic, galvanic and other apparatus, &c. The subscribers are: E. M. Hubbard, 69, Dresden Road, Hornsey Lane, N.19; and L. L. Davidson, 17, Wilderton Road, Stamford Hill, N.16. Secretary: S. J. Jack. Registered office: 5/11, Theobalds Road, W.C.1.

Institute of Radio Engineers, Ltd.—Private company. Registered May 3rd. Capital, £100 in 5s. shares. Objects: To found, finance and conduct schools, colleges, institutes, exhibitions, and displays relating to or connected with radio, television, high frequency, sound, light and low-frequency engineering and practice, &c. The subscribers are: R. Gorman, 47, Market Street, Manchester; and H. Thornton, 29, Hogarth Avenue, Burnley. Secretary: H. Thornton.

Dorset Engineering Co., Ltd.—Private company. Registered May 9th. Capital, £500 in 200 5 per cent. cumulative preference

The I.E.E. Annual Meeting

THE sixty-second annual general meeting of the Institution of Electrical Engineers was held in London on May 10th. The report of the Council shows that during the year ended March, 1934, the net increase of membership was 470, making the total 15,619.

At the next revision of bylaws the disqualification of nominees for the Council in whose favour organised canvassing takes place will be considered. The number of national certificates and diplomas in electrical engineering issued in 1933 was 1,094 in England and Wales and forty in Scotland, while seven scholarships were awarded and two grants were made to research students.

Kindred societies had had free use of the I.E.E. building for 211 meetings. All the office accommodation released by the removal of the B.B.C. had been let to E.D.A., E.L.M.A., the Electrical Research Association, the National Register of Electrical Installation Contractors, and the Institute of Transport.

Sectional Activities

During the year 540 meetings were held in London and at the local centres by members, the Council, and committees. The Wireless Section membership is 643 and the average attendance increased by 22 to 157. The Meter and Instrument Section membership is 607 and the average attendance decreased by 12 to 83. The average attendance at the twelve informal meetings decreased by 13 to 88. The membership of the nine Students' Sections is 3,470, including 1,500 graduates under the age of twenty-eight years. The newly formed Transmission Section will commence to function next session with a nucleus of members of the Overhead Lines Association (which will then cease to exist) who are also members of the I.E.E.

During the year the library had 6,816 readers (decrease 374) of whom 488 (81 more) were non-members, while 1,405 members subscribed to *Science Abstracts*—817 to both sections and 588 to the electrical section.

Private donors have made it possible for the Council to arrange for the making of "speaking portrait" films of eminent electrical engineers, the first one made being of Sir John Ambrose Fleming.

The revenue exceeded expenditure by £4,998, compared with a surplus of £7,828 for the previous year. The assets amount to £205,298 against liabilities of £10,897, leaving a surplus of £194,402, which is an improvement of £4,588. The Benevolent Fund amounted to £23,106, the donations and subscriptions totalling £2,636; about 30 per cent. of the members subscribed to the fund. Grants to fifty-three persons during the year totalled £2,600.

and 300 ordinary shares of £1 each. Objects: To carry on the business of electricians, mechanical engineers and manufacturers and workers of and dealers in electricity, motive power, electrical machines and apparatus, including surgical and dental requirements, &c. The subscribers are: C. J. C. Edwards, 2, Errington Road, Maida Hill, W.9; and John H. Lyns, 126, Campden Houses, Peel Street, Kensington, W.8. Solicitors: Underwood, Piper and Heys-Jones, 12/13, Holles Street, Cavendish Square, W.1.

Sinclair Speakers, Ltd.—Private company. Registered May 9th. Capital, £1,000 in 500 preference and 500 ordinary shares of £1 each. Objects: To acquire the business of a manufacturer of wireless apparatus now carried on by Stafford Sinclair as "Sinclair Speakers" at 49/50, Twyford Street, Caledonian Road, N.1. The subscribers are: A. E. Bailey, 27, Champion Grove, S.E.5; and A. E. Smith, 8, Kitchener Road, Thornton Heath, Surrey. The first directors are Stafford Sinclair (permanent) and others to be appointed by the subscribers. Secretary: A. E. Smith.

Returns of Electrical Companies

Turnadge & Partners, Ltd.—G. J. Hakin, 10-13, Newgate Street, E.C.1, was appointed receiver and manager on April 28th, 1934, under powers contained in debenture dated May 20th, 1933.

T. Withers, Ltd.—Capital, £1,000 in £1 shares. Return dated December 17th, 1933 (filed February 9th, 1934). 251 shares taken up. £51 paid. £200 considered as paid. Mortgages and charges, nil.

Peerless Electrical Manufacturing Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, but excluding purchase agreements, &c., dated April 20th, 1934, to secure all moneys due or to become due from the company to Lloyds Bank Ltd.

Electric & Ordnance Accessories Co., Ltd.—Satisfaction in full on March 31st, 1934, of debenture dated May 3rd, 1928, registered May 7th, 1928, securing £20,000.

Berelif, Ltd.—Satisfaction to the extent of £200 on April 14th, 1934, of a series of debentures authorised by resolution dated May 30th, 1933, and registered June 13th, 1933, securing £400.

Second debenture dated April 13th, 1934, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: G. C. Simmonds, 27, Clive Road, Quinton, Birmingham, and N. B. Simmonds, 30, Stanley Road, Quinton.

General Cable Manufacturing Co., Ltd.—Satisfaction to the extent of £875, on April 16th, 1934, of debentures authorised April 12th, 1933, and registered April 26th, 1933.

Dundas Fox, Ltd. (formerly Berk & Dundas Fox, Ltd.).—Particulars filed of £20,000 debentures authorised April 26th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the whole amount being now issued.

Homefyre, Ltd.—Particulars filed of £1,300 debentures, authorised May 1st, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Northern Wireless Relay Co., Ltd.—Mortgage, dated April 30th, 1934, to secure £6,000, charged on 79 and 81, Blackett Street, Newcastle-on-Tyne. Holders: Rock Permanent Benefit Building Society, 14, Market Street, Newcastle-on-Tyne.

Vee Cee Dry Cell Co. (1927), Ltd.—Particulars filed of £1,000 debentures, authorised May 3rd, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Associated Radio Distributors (Yorkshire), Ltd.—Capital, £500 in £1 shares. Return dated September 19th, 1933 (filed March 27th, 1934). 200 shares taken up. £200 paid. Mortgages and charges, nil.

Acorn Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated September 29th, 1933 (filed March 16th, 1934). All shares taken up. £100 paid. Mortgages and charges, nil.

J. S. Meadows, Ltd.—Capital, £100 in 50 preference and 50 ordinary shares of £1. Return dated December 12th, 1933 (filed March 15th, 1934). Ten ordinary shares taken up. £10 paid. Mortgages and charges registered: £150 debentures (part of a series for not more than £200 authorised and issued April 4th, 1934).

Cetex, Ltd.—Capital, £11,500 in 10,000 preference shares of £1 each and 30,000 ordinary shares of 1s. Return dated December 13th, 1933. 4,000 preference and 30,000 ordinary shares taken up. £4,600 paid on 4,000 preference and 12,000 ordinary shares, £900 considered as paid on 18,000 ordinary shares. Mortgages and charges, nil.

Radio Service (London), Ltd.—Satisfaction in full on May 3rd, 1934, of debenture dated July 16th, 1929, and registered same date. (According to the register of mortgages, the debenture registered July 16th, 1929, originally secured £1,500.)

The nominal capital has been increased by the addition of £9,000 in £1 shares beyond the registered capital of £1,000.

Myriad Display Co., Ltd.—Issue on April 27th, 1934, of £100 debentures, part of a series already registered.

Static Electric, Ltd.—Debenture, dated May 1st, 1934, to secure £150, charged on the company's property, present and future, including uncalled capital. Holder: H. Brummer, 1, Broom Avenue, Higher Broughton, Salford.

Britannia Electric Lamp Works, Ltd.—The nominal capital has been increased by the addition of £10,000 beyond the registered capital of £15,000. The additional capital is divided into 10,000 ordinary shares of £1 each.

Selective Radio Relay Co., Ltd.—Capital, £10,000 in 9,000 preference shares of £1 and 20,000 ordinary shares of 1s. each. Return dated January 19th, 1934. 3,600 preference and 20,000 ordinary shares taken up. £600 paid on 600 preference shares, £4,000 considered as paid on 3,000 preference and 20,000 ordinary. Mortgages and charges, nil.

Luton Broadcast Relay Service, Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £5,500. The additional capital is divided into 3,000 10 per cent. cumulative preference shares of £1.

S. H. Davis & Son (Sound Systems), Ltd.—The nominal capital has been increased by the addition of £250 in £1 ordinary shares beyond the registered capital of £200.

Wireless Instruments (Leeds), Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1933 (filed February 28th, 1934). 500 shares taken up. £500 paid. Mortgages and charges, £3,000.

Station Radio, Ltd.—Debenture dated April 26th, 1934, to secure £300, charged on the company's property, present and future, including uncalled capital. Holder: Mrs. J. Terry, Rossendale, Irlam Road, Flixton, Lancs.

Pioneer Relay Services, Ltd.—The nominal capital has been increased by the addition of £1,650 in £1 ordinary shares beyond the registered capital of £350.

Dick's Wireless and Electrical Factors, Ltd.—Debenture dated April 5th, 1934, to secure £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Millie Green, 10, Sidmouth Road, Brondesbury, N.W.6.

London Electrical Co. (Sherborne Lane), Ltd.—Two charges for £1,000 and £400 respectively dated August 11th, 1922, and July 10th, 1930, charged on 1, Sherborne Lane, E.C. (being property acquired by the company on April 16th, 1934). Registered pursuant to Section 81 of Companies Act, 1929. Holder: Miss J. Hobson, Brackenside, The Avenue, Tadworth, Surrey.

P. H. British Electrical Works, Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1933 (filed March 5th, 1934). 4,999 shares taken up. £4,999 paid. Mortgages and charges, £5,000.

City Notes

The Ever-Ready Co. (Great Britain), Ltd., reports a profit for the year ended March 31st last of £396,923, as compared with £343,473 in the preceding year, which with £46,691 brought in makes £443,614 available. The ordinary dividend is maintained at 35 per cent. for the year. The shares issued in February last rank for the final dividend of 25 per cent., and the 120,000 ordinary shares issued in part payment for plant, machinery and equipment for the new factory receive 17½ per cent. The amount carried forward is £49,344. The report states that sales for the year increased 10 per cent. in volume, but only 1 per cent. in value, owing to the effects of competition on prices. No profits for the year on the export business have been included, as at March 31st they were not finally ascertained. At the annual meeting to be held on May 31st a resolution will be submitted that the capital of the company be increased to £1,500,000 by the creation of 2,000,000 ordinary shares of 5s. each. The directors have offered to acquire by share purchase, Grosvenor Electric Batteries, Ltd., and Vince's Dry Batteries, Ltd. Two Ever-Ready ordinary shares of 5s. each are offered in exchange for three Grosvenor ordinary shares of £1 each, and one Ever-Ready 5s. ordinary share in exchange for twenty-five Vince's preferred ordinary shares of 2s. each. The directors state that the acquisition of the two concerns should result in a further stabilisation of the battery industry and bring benefit to the Ever-Ready Co. by saving in cost of production and administration. The balance of the new shares will place the company in a position to take immediate advantage of any profitable expansion of its activities.

The Craigpark Electric Cable Co., Ltd., reports a loss on the working for the year ended March 31st last of £10,117, as compared with a profit of £8,487 in the preceding year, and after providing for directors' fees and depreciation there is a deficit of £13,617. This is met by transferring £15,000 from reserve, and income tax provision not now required, leaving a credit of £1,859. To this is added £3,089 brought in, and after paying an interim dividend on the preference shares for the half-year ended September 30th last, a balance of £3,522 is carried forward. The report states that the fall in selling prices commented upon in last year's report continued to an even greater extent during the whole of the year under review, and that, taken in conjunction with a considerable shrinkage in turnover, has been the main cause contributing to the severe setback which has been experienced. The directors are taking every step to meet the position by effecting economies wherever possible. Meeting, May 22nd.

The London Passenger Transport Board has issued a statement to the effect that for various reasons it will not be able to complete its accounts for the first financial year in the time stipulated by the London Passenger Transport Act, and it is therefore applying for permission to introduce a late Parliamentary Bill to extend the time for publication of the accounts by one year, and in the meantime to authorise the Board to make payment on account of the interest on the "C" stock for the first financial year, based on an estimate of the revenues for that year, a final adjusting payment being made after the accounts for that year have been finally settled and audited. In this way the Board will be enabled to make an interim payment to the "C" stockholders shortly after June 30th.

The British Electric Traction Co., Ltd., reports a net profit for the year ended March 31st last, subject to audit, of £262,026, an increase of £16,904, as compared with the preceding year. The cumulative participating preference stock again receives 8 per cent., and after providing for the dividend on the 8 per cent. preferred ordinary stock it is proposed to pay a final

dividend of 2½ per cent. on the deferred ordinary stock, maintaining the cash distribution for the year at 5 per cent., and, in addition, to pay a bonus of 10 per cent. in fully paid £1 deferred ordinary shares. A balance of £31,952 is added to the undivided profits account, making that account £1,241,231. Meeting: June 15th.

Allgemeine Elektricitäts Gesellschaft.—The report, which has just been issued for the year ended September 30th last, states that while home sales only slightly diminished, the foreign turnover considerably declined and there was a substantial fall in the Russian trade. As a consequence the total value of the turnover fell from 220 million marks in 1931-32 to 180 millions in 1932-33. On the other hand, the revival measures adopted by the Government led in the final months of the year to an increase in the company's inland orders, a movement which has continued in the current year. In the company's own works over 30,000 persons were employed at the end of September, excluding those engaged in undertakings in which the company is interested. While the prices for essential deliveries for manufacturing increased during the year, the prices for a considerable part of the manufacturing programme further receded. In particular, the prices abroad, especially through the depreciated currencies of the chief competitive countries, were insufficient. In the home market, also, it was not possible in many cases to obtain full payment for the total expenses including the technical preparation of schemes and advice. Notwithstanding the difficulties arising from a deterioration of the economic position in many markets, the company had maintained all its foreign representatives and was endeavouring to sustain its foreign sales and extend them as far as possible. In many cases the course of business of the subsidiary companies had still been unsatisfactory. As a definite valuation of a material part of the company's assets still meets with great difficulties, the directors propose to defer further the question of a financial reorganisation, but they emphasise that material writing-down will be necessary in order to adjust book values to the conditions of remunerative working. The profit and loss account closes with a loss of 26,522,872 marks, which it is proposed to carry forward, together with a deficit of 30,657,735 marks brought forward from 1931-32.

The Calcutta Tramways Co., Ltd., reports a revenue for 1933, after deducting income tax, loan interest, &c., and transferring £65,000 to depreciation, of £97,709, as compared with £95,764 for 1932. The final ordinary dividend is 4½ per cent., making 7½ per cent. for the year (against 6 per cent.), the carry-forward being £9,458. The report states that improved traffic results continued throughout the year, receipts increasing by £25,962 and the number of passengers carried by nearly 5,000,000.

Presiding at the annual meeting on May 15th, Sir Geoffrey R. Clarke (chairman) said that notwithstanding the widespread economic depression which still continued in India and the increase of omnibus competition in Calcutta through an attempt to organise it on a sounder basis, the traffic receipts had steadily improved during the year. This improvement was due to the comparative absence of political disturbances and the more favourable attitude of the people during 1933, and to the greatly improved services which they were now offering to the public. The first-class compartments of their new trams were being fitted with electric fans, and at the same time fares had been reduced and considerable facilities were given by the issue of monthly tickets. They had obtained the right from the Howrah Bridge Commissioners to run trams on the new bridge, which it was expected would be completed within the next four years.

The Cawnpore Electric Supply Co., Ltd., held its annual meeting on May 15th, when Mr. K. A. Scott-Moncrieff (chairman), who presided, said that 1933 had been a year of steady progress. They generated 55,344,440 kWh, of which 49,631,714 kWh was sold, the sales showing an increase of 14 per cent. The maximum demand increased from 10,800 kW in 1932 to 12,100 kW in 1933. The sales of electricity for street-lighting purposes increased by 15 per cent. This was due to the new contract referred to at the last meeting, and they could look forward to a further increase during the current year. They had sold 6,000,000 kWh by special contract. This branch of their business accounted for 90 per cent. of the electricity sold, and was largely composed of the supply to textile mills which formed the chief industry of Cawnpore. The total connections to the mains had risen from 19,633 to 22,427 kW. The tramway system had been abandoned and ceased running on May 16th, 1933.

The Oriental Telephone & Electric Co., Ltd.—Presiding at the annual meeting held on May 15th, Sir A. Henry McMahon (chairman) said that their branch at Singapore showed a slight reduction in the number of exchange lines working and also in net profits during the year under review. Business in Singapore was improving, however, and reports for the first four months of the current year showed an increase in the number of exchange lines working. In Mauritius there was still a falling-off in the number of exchange lines, but the prospects were a little more encouraging. The Bombay, Bengal and Madras Telephone Companies had made good progress, and the Bombay Co. had in hand an extensive programme of capital expenditure which augured well for the future. The Rangoon Telephone Co. had maintained its normal rate of dividend (6 per cent.), but Rangoon was still overshadowed by the cloud of trade depression which showed little sign of lifting. The Hongkong Telephone Co. continued to progress.

The Compania Hispano-Americana de Electricidad ("Chade"), reports profits for 1933 of gold pesetas 68,273,545, as against 76,764,908. The profits expressed in gold currency are lower by reason of the depreciation of the Argentine peso and the reduced income derived from investments. The balance available for distribution is gold pesetas 25,165,301, against 30,088,493, after transferring to amortisation fund gold pesetas 33,813,414. It is proposed to pay a final dividend, free of Spanish taxes, of 20 Swiss fr. on "A," "B" and "C" shares and 4 Swiss fr. on "D" and "E" shares. The total dividend for 1933 will thus be 20 Argentine pesos, plus 20 Swiss fr. against 22,727 Argentine pesos, plus 20 Swiss fr. in 1932. The amount to be carried forward will be gold pesetas 9,289,212, against 5,965,956 brought in. The total of the balance sheet is gold pesetas 965,272,428, against 953,970,477 in 1932. The sales of electricity in 1933 totalled 865,249,449 kWh, against 787,353,168 kWh in 1932. Meeting: May 30th in Madrid.

Marconi's Wireless Telegraph Co., Ltd., reports a net profit for 1933 of £126,553, as against £74,735 for 1932. The ordinary dividend for the year is increased from 2 per cent. to 6 per cent., and £11,193 is carried forward. Meeting: May 23rd.

The Lancashire United Transport & Power Co., Ltd., has issued a notice to the holders of £296,500 of its 5 per cent. second mortgage debenture stock, of its intention to redeem the stock outstanding on August 15th next at par. The board has decided to issue the 300,000 5½ per cent. cumulative preference shares of £1 each, recently authorised, at par, and holders of the existing 5 per cent. second mortgage debenture stock will have the right to convert their holding into an equal amount of shares.

Edmundson's Electricity Corporation, Ltd., reports that during April the electrical energy generated and purchased by its undertakings totalled 40,618,000 kWh, as compared with 33,556,000 kWh in the corresponding month of 1933, an increase of 21 per cent. The total for the first four months of the current year was 186,067,000 kWh, an increase of 19 per cent. as compared with the corresponding period of last year.

The East African Power & Lighting Co., Ltd., reports a profit of £63,298 for 1933, to which is added £9,628 brought in. After placing £12,500 to depreciation, £3,500 to reserve, &c., it is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent. for the year (unchanged) and to carry forward £10,320.

The County of London Electric Supply Co., Ltd.—The subscription list for 1,825,000 4 per cent. cumulative preference shares of £1 each, which was opened on May 10th, was closed the same day, the issue being heavily over-subscribed.

The Bridgwater & District Electric Supply & Traction Co. reports a net profit for 1933 of £5,914, as against £5,237 in 1932. The ordinary dividend is maintained at 6 per cent. and £1,035 is carried forward.

Siemens Bros. & Co., Ltd., have announced a dividend of 4 per cent., less tax, for 1933. No interim payment was made for 1933, against an interim of 2½ per cent. for 1932, which was followed by a final payment of 4 per cent.

The Melbourne Electric Supply Co., Ltd., has declared an interim dividend on the consolidated ordinary stock of 3 per cent., tax free (same).

The British Power & Light Corporation (1929), Ltd., has declared a dividend of 3 per cent. on the ordinary shares (same).

The Associated Equipment Co., Ltd., has announced an interim dividend of 2 11/16 per cent.

The East India Tramways Co., Ltd., has declared an interim ordinary dividend of 4 per cent., less tax, at 2s. 7d. (same).

Stocks and Shares

TUESDAY EVENING.

THE incidence of the Whitsun holidays has had the usual effect of laying a check upon Stock Exchange business, but the weight of investment money that is still desirous of a more permanent place than a deposit account at the banks affords is well appreciated, and makes its effect felt amongst gilt-edged securities as a whole. Firmness in the latter stocks continues to be one of the outstanding features, while another is the strength exhibited by industrials of good class. People are becoming accustomed nowadays to the fact that from the ordinary shares in first-rate trading companies they can hardly look for more than 4 per cent. on their money. The expectation of increased dividends serves to maintain and to stimulate the flow of investment money into shares the return from which at current prices is hardly as much as can be obtained from purely gilt-edged stocks. The issues of the various public boards connected with electricity are holding their values. No changes have occurred this week.

London Passenger Transport

The London Passenger Transport Board has occasioned some little surprise by its proposal to bring forward a Bill to permit the postponement of its first accounts for a year. The initial year's operations finish with the end of next month. Owing to the protracted character of the proceedings before the Arbitration Tribunal, the Board will not be able to present the accounts which it had been hoped could be laid before the stockholders in the early autumn of this year. It is felt that postponement of the accounts might operate harshly upon the holders of the Transport "C" stock, and powers are therefore to be sought to enable the Board to pay some dividend on this particular issue. Estimates as to what the stock will receive have varied, as we have pointed out here on several occasions, from 3 per cent. to 5 per cent., caution suggesting that 3½ per cent. will be as much as holders of the stock should anticipate in respect of the first year's working. The present price of 79½ suggests that this latter view receives fairly general acceptance.

To Quote or Not to Quote?

No changes of particular consequence mark the list of prices of home electricity shares. Notting Hill preference are 15s. up at 14½, a movement which may perhaps excuse, if it does not justify, an allusion to the intention of removing the shares from our weekly list, owing to the immobility of the price. They were to have been taken out, in point of fact, next week, but evidence of public interest is afforded by recent demand for the shares; therefore the quotation remains in the catalogue. It is difficult to know what to take out

at any time, for even where price fluctuations occur infrequently, and titles are removed from the share list in consequence, it happens, as a rule, that someone complains at the non-inclusion of shares which, from the commentator's point of view, would seem to be practically dormant.

It may be of service to the investor to mention that in certain cases of new issues these can be bought in scrip shape, thereby saving the onerous stamp-duty of 20s. per £100 money. Amongst such stocks at present obtainable free of stamp-duty are the lately issued 4 per cent. debentures of the Galloway Power, London Power, and West Gloucestershire Companies; North Eastern 3½ per cent. debenture; Electrical Distribution of Yorkshire new preference; and Metropolitan Electric Cable and Construction new preference.

Electricity Supply Shares

Scottish Power shares at 2 are 1/16 lower, and Midland Counties at 1⅛ have lost 9d. In the list of London electricity supply shares, it will be noticed that the prices now rest upon the level of a 4 per cent. yield upon money spent at current quotations. Four-and-a-half months of the year have already gone, and anticipation begins to canvass the likelihood of an increase to 7½ per cent. in the standard rate of dividend in respect of the present year.

Electric Supply Corporation ordinary, slightly lower at 76s. 3d., will be quoted ex rights after the meeting to be held this week for confirmation of the new issue. City of London eased off to 36s. 3d. West Gloucestershire ordinary is 2 points higher at 87½: the preference retains its previous advance to 114½. Llanellys are a shade easier at 25s. About 2,500 North Eastern ordinary came on offer at 33s. 9d. East African Electrics at 31s. 6d. are ex dividend.

County of London New Shares

The County of London Electric Supply Co. has issued £1,825,000 of 4 per cent. preference shares at a guinea each. Although at this price the return on the money is little more than £3 16s. per cent., the issue was subscribed in a couple of hours. The market was to start in the new shares on Wednesday in this week, and a few halfpence premium was expected to develop. In advance it was difficult to tell, however, whether the issue had been stagged to any material extent.

Ever-Ready Extensions

The Ever-Ready Company has called a meeting, to be held on the last day of the current month, for the purpose of submitting and passing resolutions to increase the capital by half a million pounds, by the creation of two million ordinary shares of 5s. each, the issue being required to pay for shares in Grosvenor Electric Batteries and Vince's Dry Batteries, which the Ever-Ready Company proposes to acquire. The Ever-Ready report states that the sales increased 10 per cent. in volume, but only 1 per cent. in value, owing to the effects of competition on prices. The company made £661,000 by way of premium on shares issued during the year. After various allocations, the reserves are left at £1,190,000. The price of the shares is a little easier at 30s. The directors and the board of Vince's Batteries have recommended to their shareholders that the Ever-Ready offer shall be accepted.

Cables and Wireless

The principal feature in the market for telegraph and telephone shares is a rise to 39½ in Great Northerns. The shares have been steadily advancing in value for some time past, and a good deal of the buying has come from the Continent. At the present price, and on the basis of the 20 per cent. dividend paid annually for some years past, the yield is a shade over 5 per cent. on the money. Cables & Wireless stocks are lower, the 5½ per cent. preference having dropped to 74, the "A" ordinary stock at 20½ showing a fall of 1½ points, while the "B" ordinary is down to 9. American Telephone & Telegraph at 109½ and Internationals at 11½ are little affected by a sharp shake-out which occurred in Wall Street last week-end, in consequence of the United States Senate having passed what is called the Stock Exchange Control Bill. The practical effect of the measure will be to curtail, perhaps severely, speculation in Wall Street. A ban is placed upon dealings by American banks, which, of course, have hitherto provided considerable assistance to speculative operations. Apparently the Americans are fearful of any interference by the United States Senate with the affairs of the New York Stock Exchange.

Miscellaneous Matters

Brush ordinary stock did not hold for very long its recent rise of 2½ to 42½. The issue of the unhappy annual report, summarised on p. 687 of last week's ELECTRICAL REVIEW, had the effect of bringing in sellers, and of reducing the price to 35. Crompton Parkinsons are a good market, with a rise of 1s. 6d. to 27s. British Aluminium strengthened to 29s. 6d. Telegraph Constructions show another 1/16 fall, at 21s. 3d.

Callenders at 3 1/16 and Enfields at 4⅜ are up by 1/16 and ⅛ respectively. The Marconi Wireless figures explain the rise in dividend from 2 p.c. to 6 p.c.; the company's disposable balance of £132,400 is no less than £54,000 better than that of the previous year. Active dealings in Electric and Musical Industries left the price good at 34s. Aron Meters rose to 53s. before going back to 51s. 6d. Rubber shares reacted abruptly upon a fall in the raw material, due to sales by disappointed bulls.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. May 15.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	1	15	15	77/6	—	3 17 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/6	—	3 19 0
Chelsea	1	7	7	34/6	—	4 1 2
City of London	1	7½	7½	36/3	—9d.	4 2 10
Clyde Valley	1	7	7	42/6	—	3 5 8
County of London	1	10½	10½	58/9	—	3 11 5
Edmundson's 7% Pref.	1	7	7	34/–	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	48/9	—	3 13 9
Elec. Supply Corporation	1	11	11	76/3	—9d.	2 17 9
Kensington Ordinary	1	7	7	35/–	—	4 0 0
Lancs Light and Power	1	7	7½	38/9	—	3 17 4
London Electric	1	7	7	35/6	—	3 19 0
Metropolitan	1	10	10	53/–	—	3 15 6
Midland Counties	1	7	7	37/6	—9d.	3 14 8
Mid. Elec. Power	1	8	8	41/3	—	3 17 8
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 7
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	56/3	—	3 11 3
Notting Hill 6% Pref.	10	6	6	14½	+⅛	4 2 9
North Met. Elec. Ordinary	1	10	10	63/9	—	3 2 10
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall	1	7	7½	36/6	—	4 3 4
Scottish Power	1	8	8	2	—1/16	4 0 0
South London	1	7	7	37/–	—	3 15 9
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	—	6 16 4
Yorkshire Elec.	1	8	8	49/6	—	3 4 9
PUBLIC BOARDS.		1931.	1932.			
Central Electricity, 1950–70	Stock	5	5	116	—	4 6 2
Do. 1955–75	,,	5	5	117	—	4 5 6
Do. 1951–73	,,	4½	4½	111	—	4 1 1
Do. 1963–93	,,	—	3½	97xd.	—	3 10 8
London & Home Counties, 1955–75	,,	4½	4½	110	—	4 1 10
London Passenger Transport, A...	,,	—	4½	118½	—	3 16 0
Do. do. B...	,,	—	5	122½	—	4 1 8
Do. do. C...	,,	—	—	79½	—	—
West Midlands Joint Elec. 1948–68	,,	—	5	114	—	4 7 9
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	109½	—	8 4 4
Anglo-Am. Tel. Pref.	Stock	6	6	116	—	5 8 5
Do. Def.	,,	1½	1½	28	—	5 7 2
Cables & Wireless 5½% Pref.	,,	2¾	2¾	74	—½	3 14 4
Do. A. 7½% Ord.	,,	Nil	Nil	20½	—1½	—
Do. B. Ord.	,,	Nil	Nil	9	—½	—
Globe Tel. and T. Ord.	10	Nil	2½	10½	—	2 8 9
Do. do. Pref.	10	6	6	12½	—	4 13 4
Great Northern Tel.	10	20	20	39½	+½	5 1 3
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	8¾	—	*3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—1	—
British Electric Traction Df. Ord.	,,	5	5	640	—30	—
Do. do. Pref. Ord.	,,	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	10½	—	—
Brit. Columbia Elec. Rly. Pfe.	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds	—	5	5	24½	—	20 8 0
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	7½	—3½	—
Do. 1st Bonds	—	5	5	49½	—	10 10 6
Victoria Falls Ord.	1	15	20	6 3/16	—	3 4 9
Yorkshire (West Riding)	1	2½	5	23/3	+1/16	4 6 0
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	3	17/9	—	3 7 7
Do. Pref.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	41/3	—	2 18 1
British Aluminium Ord.	1	5	5	29/6	+6d.	3 7 9
British Insulated Ord.	1	15	15	68/9	—	4 7 3
Brush Ord.	Stock	Nil	Nil	35	—7½	—
Callender's	1	15	15	3 1/16	+1/16	5 0 0
Do. 6½% Pref.	1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord.	5/–	22½	12½	27/–	+1/6	—
Do. 8% Pref.	1	8	8	32/6	—	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	13/9	—	—
Enfield Cable Ord.	1	25	25	87/6	+½	4 11 4
English Electric	1	Nil	Nil	6/3	—	—
Do. do. Pref.	1	Nil	Nil	10/–	—	—
Ever Ready	5/–	35	35	30/–	—3d.	5 16 8
Ferranti Pref.	1	7	7	26/6	+3d.	5 5 9
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	42/6	—	3 15 1
Henley's	1	30	30	6 1/16	—	4 19 2
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	17/6	—	—
Johnson & Phillips	1	5	5	23/3xd.	—	4 6 0
Siemens Ord.	1	7½	6½	18/9	—	—
Telegraph Construction	£1	Nil	Nil	21/3	—1/16	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings taken.

1932

25615. "Photo-electric control system for escalators and like endless-band conveyors." A. S. Fitzgerald. September 14th, 1932. (408996.)

26276. "Electrical musical instruments." L. Mellersh-Jackson (O. Vierling). September 21st, 1932. (408998.)

28603. "Motors for electric meters." A. J. Martin. October 13th, 1932. (408935.)

28648. "Electric relays." Westinghouse Electric and Manufacturing Co. October 13th, 1931. (408956.)

28873. "Electron discharge devices." H. Baron (G. Bruck). October 15th, 1932. (Cognate application 33681/32.) (408939.)

28957. "Circuits for the operation of electric relays." General Electric Co., Ltd., and D. C. Espley. October 17th, 1932. (408961.)

28979. "Electrical condensers." Marconi's Wireless Telegraph Co., Ltd. October 16th, 1931. (408943.)

29109. "Device for connecting an additional loud speaker to a radio receiving set." Kolster-Brandes, Ltd., and T. D. Ward-Miller. October 18th, 1932. (408965.)

29119. "Electric switch mechanism with automatic tripping-action." Allen West & Co., Ltd., and F. J. Pavitt. October 18th, 1932. (408983.)

29157. "Electric lampholders and reflectors." H. S. Riant. October 18th, 1932. (408970.)

29399. "Electric relays." L. H. Peter, R. M. MacGregor and Westinghouse Brake and Saxby Signal Co., Ltd. October 20th, 1932. (409004.)

29459. "Ignition magnetos for internal-combustion engines." J. Lucas, Ltd., E. A. Watson and F. J. Marlow. October 21st, 1932. (409007.)

29543. "Arrangements for supplying electric current to optical sound-recording or reproducing systems." Electrical Research Products Inc. January 9th, 1932. (409012.)

29605. "Telephone systems." Automatic Electric Co., Ltd. November 9th, 1931. (409015.)

29948. "Electric contact devices of the drum type." J. G. Smithson and R. W. Purdie. October 26th, 1932. (409024.)

29950. "Electric cut-outs." Ferguson, Pailin, Ltd., and G. Pailin. October 26th, 1932. (409025.)

29969. "Switching arrangements for electrical signalling systems." Electrical Research Products Inc. December 23rd, 1931. (409026.)

30410. "Spark-ignition circuits for internal-combustion engines." British Thomson-Houston Co., Ltd., C. J. Morton and L. Griffiths. October 29th, 1932. (409036.)

30758. "Method of piezo-electric apparatus for converting electrical impulses into acoustical impulses in a surrounding fluid medium and vice versa." A. H. Stevens (Brush Development Co.). November 1st, 1932. (409040.)

31206. "Electric tramway or railway vehicles." E. M. B. Co., Ltd., and G. N. Cadbury. November 5th, 1932. (409045.)

31585. "Switchgear for high-tension aerial electric transmission lines." W. H. Turner and W. H. Isherwood. November 9th, 1932. (409047.)

32464. "Method of producing electric discharge tubes." Radioakt-Ges., D. S. Loewe and Dr. E. Waldschmidt. November 19th, 1931. (Addition to 32082/32.) (409051.)

35106. "Electrically driven clocks." S. H. Sershall. December 12th, 1932. (409067.)

35168. "Highly sensitive circuits." H. W. Pook and Radiovisor Parent, Ltd. December 12th, 1932. (409068.)

36479. "Electric retractive switches with delayed return." International General Electric Co., Inc. December 23rd, 1931. (409075.)

36932. "Means for converting direct current into alternating current." International General Electric Co., Inc. December 31st, 1931. (409079.)

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541. "Contacts for electric circuit-breakers, switches, connectors and the like." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. January 6th, 1933. (Cognate application 3770/33.) (409085.)

947. "Automatic circuit-breakers." J. A. Crabtree. January 11th, 1933. (409087.)

1434. "Cover plate for an aperture in a sealing-chamber or other enclosure for electrical connections." W. T. Henley's Telegraph Works Co., Ltd., and A. T. Crowe. January 16th, 1933. (409090.)

1496 "Anti-vibration device for portable electric lamps." R. Allan. January 17th, 1933. (409091.)

2166. "Electric circuit-breakers." Allmänna Svenska Elektriska Aktiebolaget. June 22nd, 1932. (Addition to 2165/33.) (Divided application on 2165/33.) (409099.)

2679. "Electro-mechanical setting mechanism for use with calculating machines and cash registers." Dr. G. Gerhold. February 15th, 1932. (409100.)

4512. "Thermo-electric control device, particularly applicable to diathermic masks employed for the aesthetic treatment of the human face." X. Bender. February 14th, 1933. (409106.)

6778. "Transmission of radio for carrier-current line communications or signals." C. F. Elwell and F. E. Terman. March 5th, 1932. (409115.)

6857. "Multiplex signalling systems." A. Montani. April 16th, 1932. (409116.)

10111. "Booster transformer voltage-regulating systems." Allmänna Svenska Elektriska Aktiebolaget and A. Schaanning. April 4th, 1933. (409128.)

15005. "Arc-quenching circuit-breaking apparatus for alternating current." Siemens-Schuckertwerke Akt.-Ges. May 24th, 1932. (Cognate applications 15006/33, 15007/33 and 15008/33.) (409142.)

16481. "Electric safety mechanism for kinematographs." V. Gazulla and D. Aguelo. June 8th, 1933. (409146.)

17513. "Methods of improving electrical conductors." R. F. McKay (International Latex Processes, Ltd.). June 20th, 1933. (409151.)

18510. "Combined plug-and-socket plug members and adaptors for electric circuits." A. P. Lundberg & Sons, Ltd., and G. Pegg. June 29th, 1933. (409155.)

20399. "Fusible electric cut-outs." British Thomson-Houston Co., Ltd. July 19th, 1932. (409172.)

20646. "Electric resistances." Patent Treuhand Ges. für Elektrische Gluhlampen. August 8th, 1932. (409174.)

21735. "Electrically synchronised apparatus more particularly for electrical contact-making devices." English Electric Co., Ltd., and I. D. Campbell. August 2nd, 1933. (409178.)

22075. "Electrical fixtures supporting and connecting devices." S. Kelso. August 5th, 1933. (409180.)

22614. "Indirectly heated cathodes for electric discharge tubes." Radio Akt.-Ges., D. S. Loewe and Dr. E. Waldschmidt. August 20th, 1932. (409183.)

24034. "Mercury-vapour arc apparatus." Akt.-Ges. Brown Boveri et Cie. August 30th, 1932. (409190.)

24490. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd. September 29th, 1932. (409193.)

25603. "Quick make-and-break electric switches." F. L. Cook. November 16th, 1932. (409202.)

27410. "Electrical equipment for motor vehicles." C. J. Evans and S. C. Evans. October 5th, 1933. (409205.)

29708. "Resistance devices for use in connection with indicating or recording instruments." Electroflo Meters Co., Ltd., and B. Dunglinson. October 26th, 1933. (409218.)

29796. "Cathode-ray tubes." Telefunken Ges. für Drahtlose Telegraphie. October 26th, 1932. (409221.)

30775. "X-ray installations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 24th, 1932. (Addition to 396803.) (409229.)

31529. "Electric tumbler switches." R. Bain and N. Allday. November 13th, 1933. (409232.)

32329. "Electric lamps." General Electric Co., Ltd. December 21st, 1932. (409235.)

32874. "Combined electricity supply and protection systems for operating colliery machines." G. Ellison, Ltd., and J. Anderson. November 24th, 1933. (409239.)

33157. "Electric discharge tubes." C. H. F. Muller Akt.-Ges. December 6th, 1932. (Addition to 406880.) (409242.)

25887. "Sockets for electric lamps." British Thomson-Houston Co., Ltd. December 24th, 1932. (409253.)

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4704. "Electrical socket couplings." J. A. Crabtree. September 21st, 1932. (Divided application on 26210/32.) (409017.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 9th :—

Philburgin (lettering and design). No. 543091. Class 4. Carbon for electrical purposes.—Philipp Burger, Berlin. (British representatives : Chatwin & Co., 253, Gray's Inn Road, W.C.1.)

Rectiverter. No. 549840. Class 6. Machinery of all kinds and parts thereof.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Freed-Eisemann (lettering and design). No. 541090. Class 8. Radio-receiving apparatus and parts thereof.—Freed Television and Radio Corporation, Long Island City, N.Y. (British representatives : Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Roneo. No. 539965. Class 13. Electric lamps (ordinary).—B.I.M., Ltd., Roding Street Works, Ilford, Essex.

Tricoleen. No. 543878. Class 47. Lubricants.—Concordia Electric Safety Lamp Co., Ltd., Thor Works, Tredegar Street, Cardiff.

Magnetic Metal Treatment

THE series of "rays," or vibrations of descending frequency, from the cosmic through visible light and heat waves to the electromagnetic is said to have been extended at its low-frequency end. According to Mr. Edward G. Herbert the newly discovered pulsations are much slower than those formerly known. They manifest themselves by alternating changes of hardness in metals, and their rates of vibration vary from a few minutes to several hours per cycle. The pulsations can be set going by various agencies, of which heat, magnetism, and mechanical deformation of the metal are the most usual. They have been found to occur in a variety of steels, brass, aluminium alloys, pure iron, gold, and nickel, and in carbon. They are more rapid in hot metals than in cold, the highest periodicity actually measured being one of 24 minutes per cycle in gold at 76 deg. C. In other hot metals periodicities of 1 hour to 1½ hour have been found, and in cold metals the most usual frequency is one of about 6 hours per cycle.

That they are electromagnetic in character is indicated by the fact that they can be stabilised at any selected phase by placing the metal for a few minutes in a strong, magnetic field, and this may result in a permanent change in the physical properties of the metal, depending on the particular phase of the fluctuations selected for stabilisation. There is no reason to believe that these fluctuations differ, except in speed, from the more rapid vibrations. The new fluctuations were discovered by means of hardness tests made at frequent intervals over long periods of time. The fluctuations are believed to be due to periodic changes in the electromagnetic force of cohesion between the crystal slip planes on which deformation takes place under the influence of the hardness test, a variation of the cohesion between the planes resulting in a corresponding variation in the resistance to slip, and in the "hardness" which is a measure of that resistance.

Continued research with pure metals has suggested a relationship between the hardness fluctuations revealed by Mr. Herbert's experiments and the more familiar forms of electromagnetic vibrations.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrow-in-Furness.—Bus depôt, Jute works site; borough engineer.

Bedwas and Machin.—Houses (100), Trethomas; G. Kenshole, architect, Cardiff.

Berkshire.—Schools, Abingdon and Didcot, for County E.C.; director of education, Reading. Mental hospital extensions (£12,738); county architect, Reading.

Birmingham.—Office, Waterloo Street (£50,000), with electrical work; C. Bryant & Son, builders, Small Heath. Technical school, Bordesley Green (£30,000), with electrical work; Buckland & Hayward, architects, Norwich Union Chambers, Concreve Street.

Blackburn (WEST LOTHIAN).—Houses (40); C. Hamilton, county architect, County Buildings, Linlithgow.

Blackpool.—Houses (45), Acre Gate; Hitchin & Bairstow. Houses (86), Holmfield Road; Sir L. Parkinson & Co., Ltd. Technical college; R. H. Tarron, Hull.

Bristol.—Flats, Hotwell Road (£25,000), with electrical work; Spackman & Sons, builders, Hunt Street, Swindon.

Bromley (KENT).—School, Hayes, for Borough E.C.; W. A. Forsyth, architect, London.

Canterbury.—Houses, Thanington; city surveyor.

Cardiff.—Houses (225), for slum scheme, various sites, and 234 houses, Tremorfa Estate; city engineer.

Carlisle.—Houses (64), Inglewood Estate; Border Engineering Contractors, Ltd.

Cheadle.—Houses (700); James Wild & Co. (Estates), Ltd., 42, King Street West, Manchester.

Devizes.—Houses (26), Jump Farm Estate, for R. C. Overington.

Droitwich.—Missionary College, Hadzer, for the Fathers of the Devine Wood, St. Richard's Mission House (£20,000).

Droylsden.—Houses (80), Alderdale Estate, Edge Lane; W. Farley, builder, West Street.

Dundee.—Reconstruction of St. Joseph's R.C. Boys' Primary School and St. Mary's R.C. Girls' Primary School, Lochee; architect, Education Committee.

East Grinstead.—Houses (48); U.D.C. surveyor.

Edinburgh.—Houses (59), Bellevue Street and West Annandale Street; J. Miller, builder, 88, Hanover Street. Church and hall (£10,000) for the Richmond Church of Scotland trustees, Wauchope Terrace; Reid & Forbes, architects, 17, Great Stuart Street.

Essex.—Nurses' home, poor law institution, Romford, and schools, Chipping Ongar, Dagenham, and Harold Wood; county architect.

Gillingham (KENT).—Houses (22), Cecil Road, for Mackintosh Bros. Houses (120), Hawthorne Avenue, for G. H. Ward. Houses (24), Woodlands Road, for the City of Rochester Land Co.

Glamorganshire.—Junior school, Whitchurch, for County E.C.

Glasgow.—Houses (160) for the Corporation housing department; architect, housing department. Cinema, Paisley Road West, Cardonald; Bryden, Robertson & Boyd, architects, 147, Bath Street.

Grantham.—Hospital (£18,787) for Building Committee; Bernard Pumfrey, Ltd., Gainsborough.

Great Yarmouth.—Flats (56), North Denes Estate; borough engineer.

Hastings.—Flats, Winding Street (£13,827); borough engineer.

Hebburn-on-Tyne.—Houses (46), adjoining Victoria Road; G. R. Smith, architect, 63, King Street, South Shields.

Hemel Hempstead.—Houses (50); E. Mills, builder, Beaconsfield. School, Crabtree Lane; Major Maule, architect.

Hertfordshire.—Schools, Cuffley and Russells Estate, Watford, for County E.C.

Inverness.—Advance division school (£45,000), for County E.C.; director of education, Inverness.

Irish Free State.—(ENNIS, CO. CLARE).—Installation of electric lighting at the County Hospital, for the County Board of Health; P. J. Sheahan, architect, 47, O'Connell Street, Limerick. (MALLOW, CO. CORK).—Hospital, for North Cork County Board of Public Assistance; Board's architect, County Home.

Irvine.—Houses (100); burgh surveyor.

Kent.—School, Offham, for County E.C.; E. Salter Davies, director of education, Maidstone.

Kilmarnock.—Houses (98), electrical work; James Hay & Steel, architects, West George Street.

Lanarkshire.—Houses (88), electrical work, for C.C.; P. C. Smith, architect, 13, Clydesdale Street, Hamilton. Extensions to Hairmyres Hospital (£35,300), and courthouse, Hamilton (£7,000), for C.C.; clerk, Glasgow.

Leicestershire.—Primary school, Coalville (£13,394) for County E.C.

Lerwick.—Central Public School; P. Thompson, architect, Fort Road.

Lincoln.—Houses (50), Simon's Hill Estate; city engineer.

Liverpool.—Cinema at the Railway Station for the British News Theatre, Ltd., 24, Coleman Street, London, E.C.2; Alister G. MacDonald, architect, 13, Queen Anne's Gate, London, S.W.1.

London.—(ACTON).—Factory, Western Avenue; C. F. Ince & Sons, Ltd. (BOW).—Extensions, St. Andrew's Hospital (£17,960); L.C.C. architect. (EALING).—Houses (146), Beechwood Avenue; Leamington Court Estates, Ltd. Houses (50), Mildred Avenue; Swannell & Sly, architects. Film studios for Gaumont British Picture Corporation, Ltd., Islips Manor Estate; Nicholas & Dixon-Spain, architects. (HAMMERSMITH).—Equipment to medical school (£25,570); L.C.C. architect. (HANWELL).—Nurses' home, for mental hospital (£36,500); L.C.C. architect. (LEWISHAM).—Houses (38), Winn Road Estate; Wates (Streatham), Ltd. (STEPNEY).—Re-housing, Quaker Street area (£35,500); L.C.C. architect. (STOCKWELL).—Extensions, South Western Hospital (£22,700); L.C.C. architect. (WILLESDEN).—Factory, for G. Beaton & Sons, Ltd.

Loughborough.—Factory, Mountsorrel, for Clarke's Boxes, Ltd.

Luton.—Houses (52) and bungalows; R.D.C. surveyor.

Lymm (CHESHIRE).—Houses (157) and shops, Statham, for W. Turner.

Manchester.—Cinema at the corner of Oxford Street; Alister MacDonald, architect, 13, Queen Anne's Gate, London, S.W.1. Factory, Wythenshawe, for John Crampton & Co., Ltd., Princes Street, Cornbrook; Harry S. Fairhurst & Son, architect, 55, Brown Street.

Mirfield.—Houses (89); U.D.C. surveyor.

Newcastle-on-Tyne.—Houses, Fenham Hall Drive; Watson & Scott, architects, Pilgrim Street. Public elementary school, Northumberland Road, for E.C.; T. Walling, director of education. R.C. schools for St. Wilfrid's Church (£8,000) with electrical work; Stienlet & Maxwell, architects, 5, Saville Chambers.

Oldbury.—Houses (28), Church Bridge; U.D.C. surveyor. Houses (200); Workmen's Housing Association, Ltd. School (300 places), Bleak House Road, for E.C.; director of education.

Peterborough.—School, Fullbridge Road; S. Dodson & Sons, architects, 15, Queen Street.

Portsmouth.—Houses (60), Hayling Avenue; G. Wallis, Guildhall (£40,000); city engineer.

Prudhoe (NORTHUMBERLAND).—Hospital, Prudhoe Hall Colony for the Mentally Defective Board (£13,223); Henderson Brothers, Smith Street, South Shields.

Purfleet.—Factory extensions, West Thurrock, for Roberts Process, Ltd.

Reading.—Houses (288), Elms Estate, for Industrial Builders, Ltd., 9, Tavistock Road, Croydon. Houses (26), Stanhope Road, for Hayes Bridge Estate, Ltd. Corn exchange (£11,683); Charles Smith & Son, architects, 164, Friar Street.

Reigate.—Houses (28), Prices Lane; Davis Estate (Surrey), Ltd. Telephone exchange, for H.M. Office of Works, King Charles Street, London, S.W. Houses (100), Colesmead Estate, Redhill; borough surveyor.

Rickmansworth.—Senior school, Mill End; S. Dawe, architect.

Rochester.—Cinema (£70,000), for Majestic (Rochester), Ltd.; H. Weston and A. W. Kenyon, architects, London. Senior boys' school, Strood, for City E.C.; E. H. Webb, secretary.

Rowley Regis.—Town hall and offices (£40,000); borough surveyor.

Rushden.—Houses (66), Highfield Road; J. W. Williamson & Sons, Ltd., Peterborough.

St. Helens.—Houses (260), by direct labour; borough surveyor.

Shirley (WARWICKSHIRE).—Cinema, Stratford Road; Satchwell & Roberts, architects, 6, New Street, Birmingham.

Smethwick.—Houses (218); borough surveyor.

Sowerby Bridge.—Houses (34), and bungalows, Beechwood Estate; U.D.C. surveyor.

Spalding.—Houses (42), Marsh Rails Road; A. E. Palmer, U.D.C. architect, 1a, Pinchbeck Road.

Staffordshire.—Senior schools, Stone (£13,465), for County E.C.; director of education, Stafford. Extensions to mining college, Cannock (£9,825), for County E.C.; J. & F. Wootton, Ltd., builders, Bloxwich.

Stockport.—High school, Heaton Mersey, for E.C.; L. Yates, architects' department, Town Hall.

Stourbridge.—Houses (100), Hodge Hill Estate, and 20, Forge Hill Estate; borough surveyor. Library, Lye; F. Woodward, borough surveyor.

Sunderland.—Houses (48), Cheriot Street and Orchard Street; A. Suttel, architect, Victoria Avenue, Harrogate.

Swaffham.—Houses (100); U.D.C. surveyor.

Torquay.—Senior school, Crocket Field Road; borough engineer.

Urmston.—Houses (48), Lostock Road, Davyhulme; E. & J. Slater, 111, King Street, Stretford. Houses (64), Canterbury, Lichfield, Westminster roads and Wimbourne Avenue; A. Locke, Ltd., Lostock Road. Houses (99), Rothiemay Road, Flixton; J. Barker, Woodsen Road. Houses (33), Cranford Estate; D. Franklyn, 423, Moorside Road, Flixton.

Walsall.—Houses (49); L. G. Pearce, builder. Houses (31), Borneo Street (£8,299); George Insley, Ltd. Bus station, St. Paul's Street (£14,000), and Goscote hospital, extensions (£18,500); borough engineer.

Warlingham.—Houses (56), Clyde Avenue, Hamsey Green; E. A. Thorn & Son.

Warrington.—Houses (42), Thelwell Lane; Mr. Ardern.

Watford.—School centre, Leggatts Way (£2,746); S. Dawe, architect.

Weston-super-Mare.—Cinema, junction of Locking and Walliscote Roads (£40,000); Sir Duncan Grey.

West Sussex.—County offices, Chichester (£61,000); R. J. Barwick, builder, Market Street, Dover.

Whitby.—Houses (104), Gallows Close Estate; U.D.C. surveyor.

Wigan.—Grammar school for Board of Governors (£50,000); A. E. Mumby, architect, 9, Old Square, Lincoln Inn, W.C.2.

Wrexham.—Houses (200), Spring Lodge Estate; Lockwood, Abercrombie & Saxon, architects, Cathedral Chambers, Chester.

Winchburgh (WEST LOTHIAN).—Houses (48); C. Hamilton, county architect, County Buildings, Linlithgow.

Yeovil.—Glove factory, Highfield Road, for Messrs. Freke, Preston Grove.

York.—Houses (176), and flats, and slipper baths (£3,020), Huntington Road Estate; R. G. Tarran, builder.